SEPTEMBER 1956

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

Boosting Gear Production . p. 75 · Mechanized Assembly . p. 76
Tool Control . . . p. 81 · Dry Air Power . . . p. 87 · Thread Measuring . . . p. 91
Complete Editorial Index . . . p. 68
New Products . . . p. 174 Shop Aids . . . p. 112 Helpful Literature . . . p. 130

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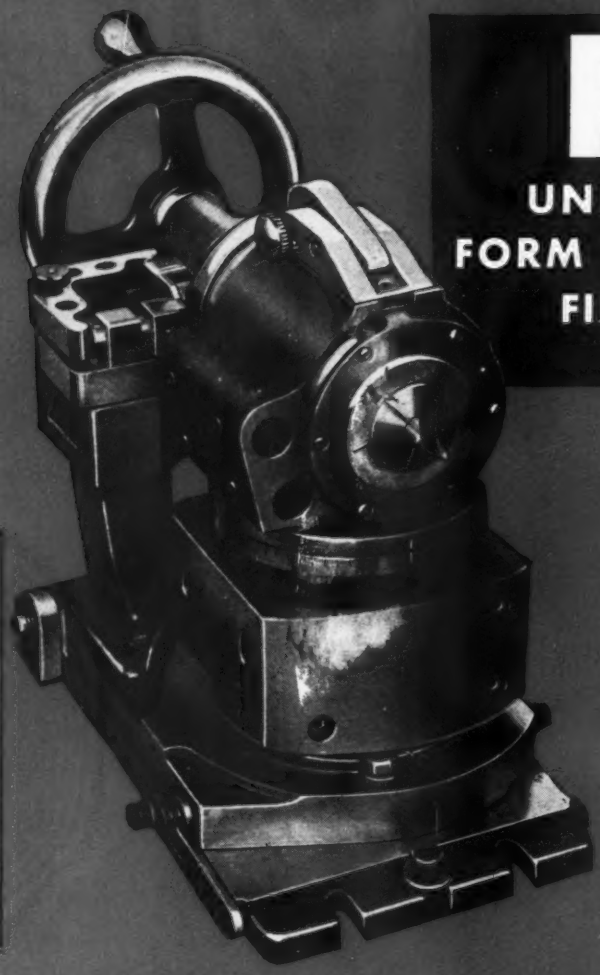

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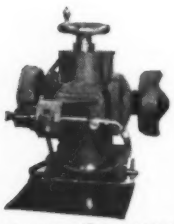

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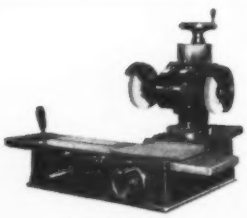

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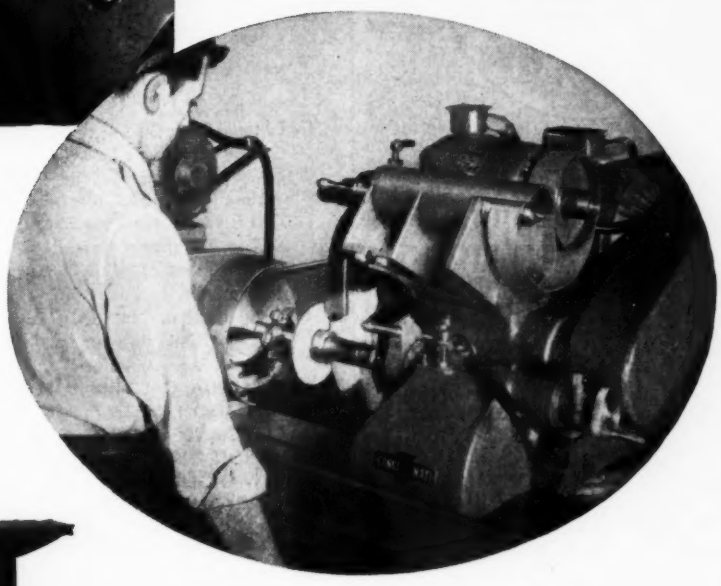

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TOOLING and PRODUCTION
The Magazine of Manufacturing Management

Published Monthly by Huebner Publications, Inc.

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SEPTEMBER, 1956

George J. Huebner, Founder

Complete Index ..... Page 68
Editorial ..... Page 71

TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our BPA verification.

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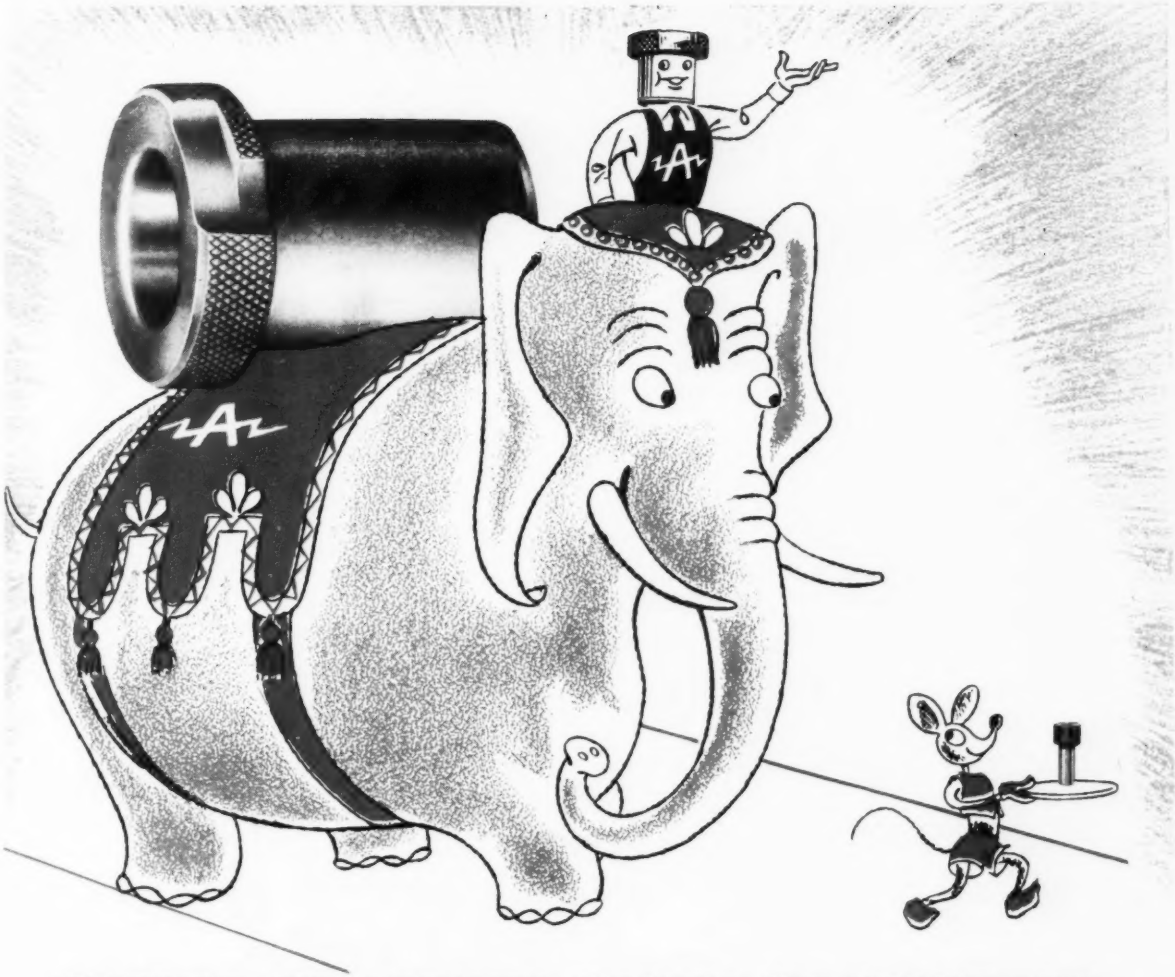

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CIRCLE INFORM-A-GRAM KEY NO. 5

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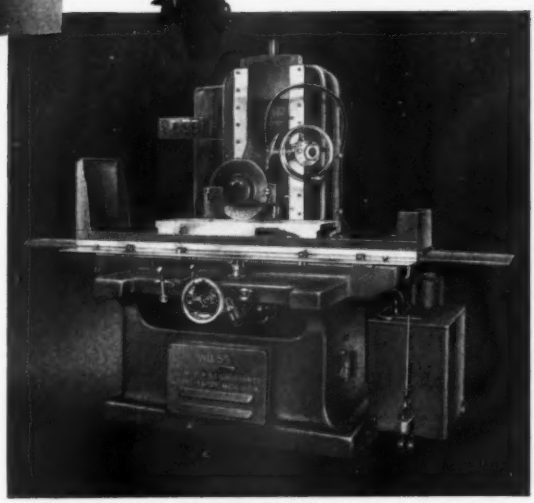
NORTH AMERICAN AVIATION, INC.

Precision is paramount in the manufacture of components for aircraft power and control. That's why these makers of precision parts have Grand Rapids Grinders in their toolrooms — for the utmost in precision grinding.

Model No. 55, for example, features one-piece column and base for permanent vibrationless rigidity. Longitudinal travel table and cross feed are hydraulically actuated. Wheel head has powered rapid vertical travel. And it's faster than any other grinder of this type and size . . . with variable table speed up to 125 fpm.

With these built-in precision features typical of all Grand Rapids Grinders, it's no wonder they're found in leading toolrooms.



GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speeds 1925 and 2500 rpm.

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PERFORMANCE FIGURES WITH Acme-FETTE

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would look good in any shop!
now look even better!
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THREAD ROLLING HEAD
OUR JOB: to provide the Right Machine for YOUR JOB
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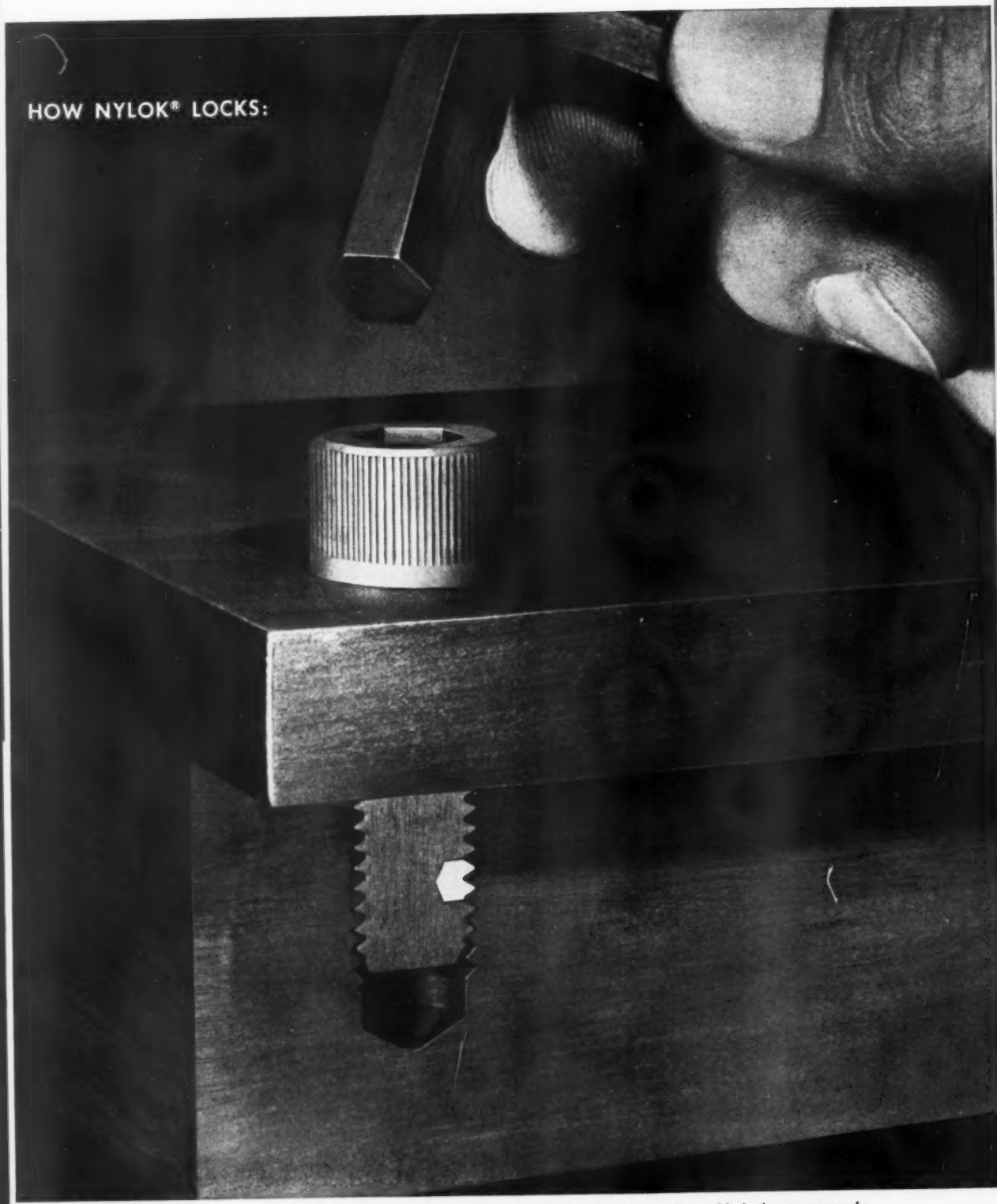
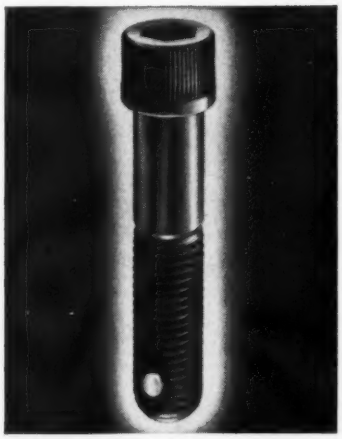
NEW—self-locking UNBRAKO



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together and locks the screw securely.

socket head cap screws



Self-locking UNBRAKO socket head cap screw.

BEFORE ASSEMBLY. The nylon pellet projects slightly. When assembled, threads will be impressed into it.

AFTER REMOVAL. "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

They won't work loose. And they simplify design and save production time.

UNBRAKO socket head cap screws are now available embodying the Nylok* self-locking principle. Nylok provides the first truly practical solution to the problem of making cap screws self-locking.

An UNBRAKO cap screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not work loose.

You save production time when you make products with self-locking UNBRAKOs. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. And in many cases you will save weight and mass by using shorter screws in tapped holes instead of drilling through and using nuts and lockwashers.

Self-locking UNBRAKOs are reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, when screws are properly seated, the locking pellet also functions as a liquid seal.

A complete line of self-locking UNBRAKO socket screw products, in a wide range of standard sizes, materials and finishes, is available through your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

**T.M. Reg. U.S. Pat. Off., The Nylok Corporation*

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hand feed precision surface grinder!

Everyone else in your company will, too! The new Abrasive Six Eighteen combines new size (6" x 18") and modern design with new Abrasive-engineered operational features.

Our new illustrated catalog tells all . . . all about Abrasive's effortless anti-friction roller ways; totally enclosed motorized spindle; new, chatterless cable table drive (successfully tested for over 1,000,000 quick reversals); convenient, waist high table and elevating hand wheels; deep, heavily-ribbed saddle; optional 12" or 7" wheel head; and how you can have the elevating and table hand wheels on either right or left.

Yours Free!

ABRASIVE
Machine Tool Company
East Providence 14, Rhode Island

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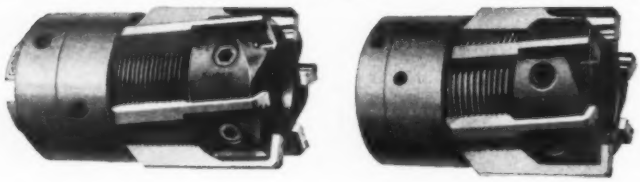
McCROSKY



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CIRCLE INFORM-A-GRAM KEY NO. 12

★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

THE POWER OF THE COMPUTER

by George J. Huebner, Jr.
Executive Engineer — Research
CHRYSLER CORPORATION
Detroit, Michigan

NO ONE IN ENGINEERING could fail to appreciate the honor of speaking to this distinguished gathering, forming as it does, an integral part of a most important conference. The application of mathematics to engineering surely has never been in doubt; but as engineers wean themselves from the deep-rooted empiricism of the past to the rationalism of the future, the quality and quantity of the necessary mathematical development seems almost overpowering. The work of conferences such as this is of inestimable value in indicating the direction we must go; and I am deeply grateful for the opportunity to become part of it.

Yet what can I say that will be of interest to you? I have before me an audience surfeited with two days of abstruse discussion; and now, replete with food and knowledge, wishing nothing so much as a quiet hour of rumination. It would therefore be indiscreet, even if it were possible, for me to place weighty scientific matters before you; and I hope you will settle back comfortably while I give you a brief history of our experience with electronic computers, and our struggle from humble beginnings to some slight competence in this field.

The accelerated tempo of engineering activity following the war found us suffering from the universal shortage of engineers. Yet our war work had shown very strikingly that "laisse-faire" design procedures could no longer be tolerated, and that the man-hours of engineering on any project must be substantially increased to avoid costly mistakes.

This address was made before the University of Michigan's June 20-22 Conference on Mathematics in Engineering where Mr. Huebner was guest speaker at the conference banquet. For more "Mathematics in Engineering" see this month's editorial page. Editor.

One of the first places where the computer came to our rescue was in the design of engine valve gear. Prior to the war the practice had been to design cams to predetermined geometrical profiles—easy to compute and easy to draw. Such cams were perfectly satisfactory for side-valve engines or overhead camshafts, where the design was inherently stiff.

AS VALVE ACTION GETS MORE COMPLEX — SO DOES THE MATH

The pushrod type of valve gear, however, was much less amenable to discipline; and the absorption of an impact by a flexible system proved to be a very sticky problem. It was found necessary to specify the valve accelerations with much greater exactness than before; and by a process of continuous refinement we finally arrived at a six-term polynomial equation which specified acceleration throughout the valve-opening process. Normally we would have got no further; for the computations were quite laborious and it was necessary to survey the entire field to determine the induced vibration amplitude and the selection of suitable coefficients. Fortunately, about this time we were given part-time access to one of our I.B.M. Type 405 accounting machines; and by the process of wiring up a new central panel for each problem our eager beavers reduced the cam problem to practicality.

MACHINE TAUGHT TO PLOT CURVES

Not only did the machine compute the cam profile but it was taught to plot the curve to scale, thus providing a visual check on accuracy. Finally it was found that the transcription of the data on the drawings resulted in numerous errors, to avoid which the computer printed the tabular values which were then transferred to the drawing photographically.

Arising out of this valve gear problem was the determination of energy inputs to the system. This involved a harmonic analysis of the cam profile using 360 ordinates. Our previous efforts with a Runge 72 ordinate schedule, the most extensive then available, had proven laborious and of doubtful accuracy; but the 360 ordinate computer schedule was found both painless and of adequate accuracy for our needs.

The third problem which was fed the computer was the determination of bearing loads in a new series of engines. This problem normally takes about two weeks of combined desk-calculator computation and graphical construction. By skillful use of the facilities available, this time was reduced to four hours, at the end of which neat tables were available giving perpendicular components of the loads at regular intervals, the resultant at each point

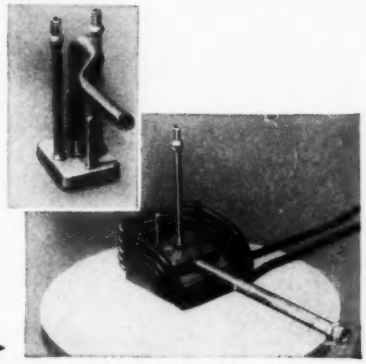
. . . *Continued on Page 18*

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.

TYPICAL INDUCTION HEATING APPLICATIONS

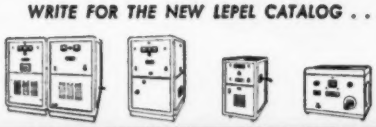
A Lepel installation at Federal Telephone and Radio Co. shown soldering transformer terminals. A precision operation made so simple that even unskilled operators can achieve excellent results on a production basis.



The simultaneous soldering of a group of components within one load coil is an ideal application for induction heating. The assemblies consist of mounting studs and tubes inserted into a machined part together with preformed solder rings. The heating is done so rapidly that there is practically no scaling or discoloration.

Electronic Tube Generators—1 KW; 2½KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.
Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.



All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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CIRCLE INFORM-A-GRAM KEY NO. 13

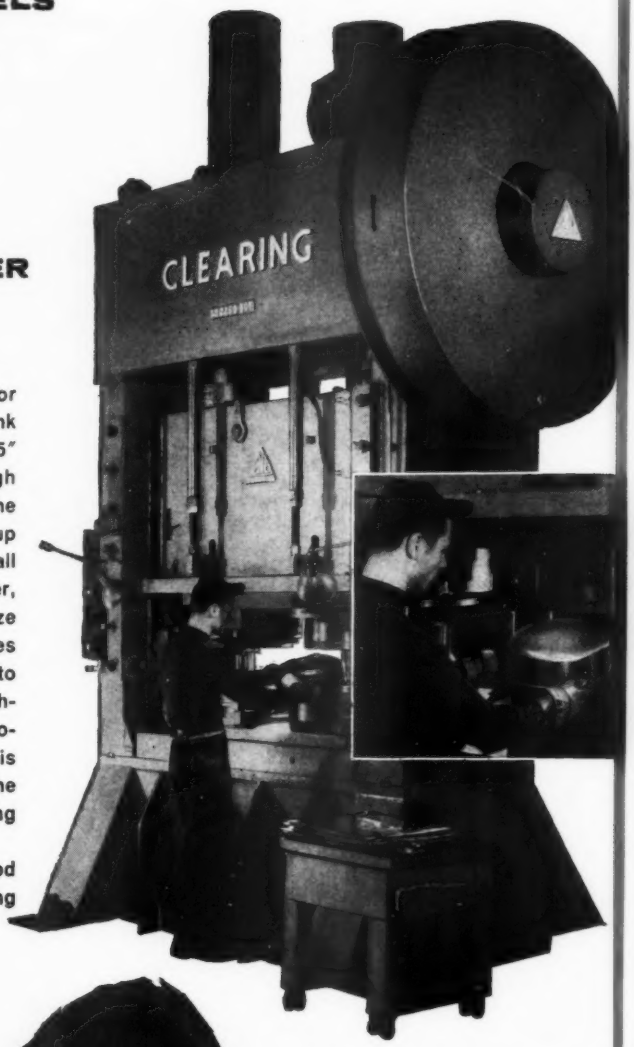
PRODUCING PRESSURE VESSELS

Profitably

CLEARING PRESS RIGHT ANSWER FOR TAIT MFG. CO.

Tait Mfg. Co. in Dayton, Ohio found the right answer for production of pressure vessels in the Clearing double crank press shown here. The vessels are produced from .025″ stainless steel blanks which are drawn to a depth of 5″. High blankholding pressure (70 tons) required at the start of the draw requires that the press develop high tonnage 5″ up from bottom stroke. Normally these requirements would call for a press far larger than the one shown at right. However, Clearing engineers designed the press with an oversize drive—a 500-ton drive in a 250-ton frame. Two sets of dies are used in the press, one to trim and draw, the other to pierce and emboss. The press is equipped with two cushions in the bed. Seventy tons of cushion pressure is provided on the draw side for blankholding. This pressure is reduced to 35 tons automatically at a point 1½″ down on the draw. The other cushion provides 10 tons of stripping pressure.

If you are looking for an efficient and economical method to produce your product more profitably, call on Clearing Machine Corporation to discuss your problem.



This Clearing double crank press with a oversize drive develops high tonnage fiv inches from bottom stroke, easily solvin the problem of a 5" draw in stainless stee

Write for colorful brochure, "Thinking about a better way to do the job?" No obligation.

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION *Division of U. S. INDUSTRIES, Inc.*

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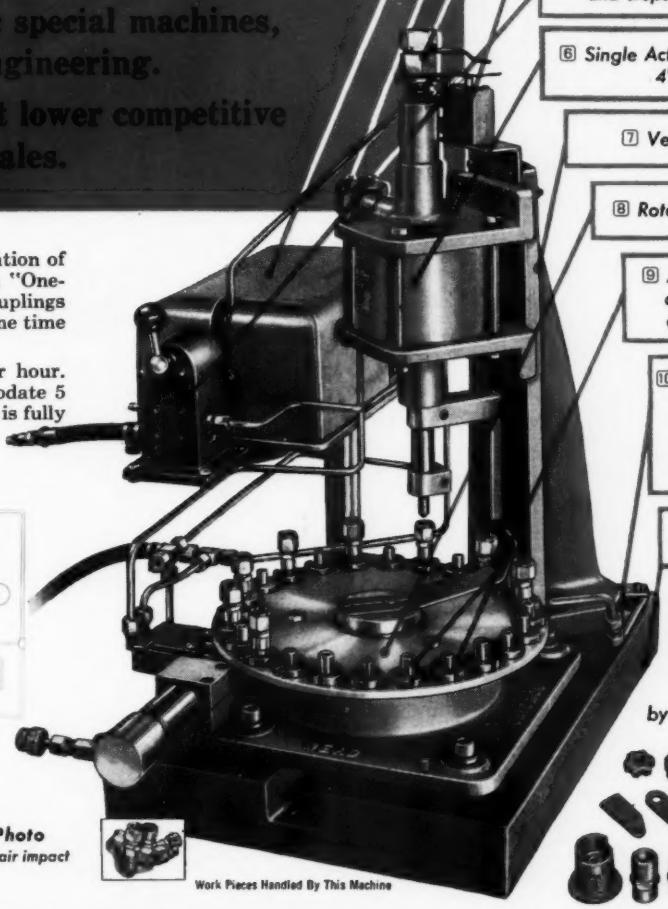
YOU can reduce your cost of making small parts!

Standard Mead units combine easily to make automatic special machines, with little or no engineering.

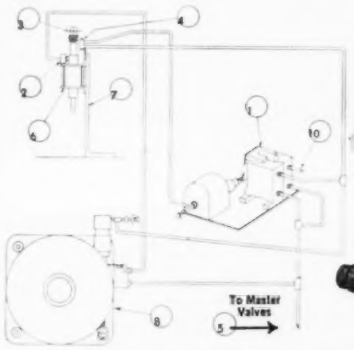
Lower costs permit lower competitive prices, increased sales.

A simple and inexpensive combination of Mead pneumatic devices makes a "One-Man Factory" to assemble brass couplings by flaring neck into nut, at the same time forming a fluid-tight seat.

Output approximately 2500 per hour. Two sets of 12 mandrels accommodate 5 different styles and sizes. Operation is fully automatic except for loading.



1. Model 2 Meadmatic Timer
2. #2 Quick Exhaust Valve to speed up return stroke
3. Adjustable depth stop with spring return
4. Cycle release valve (included with timer) to reverse cycle at end of down stroke
5. 4-B Master Valve starts and stops entire system
6. Single Acting Cylinder, 4" bore
7. Vertical Stand
8. Rotary Work Feeder
9. Alternate mandrels for two sizes of brass couplings
10. Air blast ejection of finished parts, by jet piped from second of two valves in timer
11. Universal Base



Circuit Diagram of Units in This Photo
Combine readily to feed work to drill press, air impact hammer for a wide variety of operations.

Work Pieces Handled By This Machine

Typical Work Pieces Handled *by Mead work feeders*

MEAD SPECIALTIES COMPANY, Dept. HA-96, 4114 No. Knox Ave., Chicago 41, Ill.

Memo Coupon

MEAD SPECIALTIES CO.
4114 N. Knox Ave., DEPT. HA-96, Chicago 41, Ill.

Send free copy of new, colored MEAD INDUSTRIAL AIR POWER CATALOG describing the complete line of famous Mead air-operated devices.

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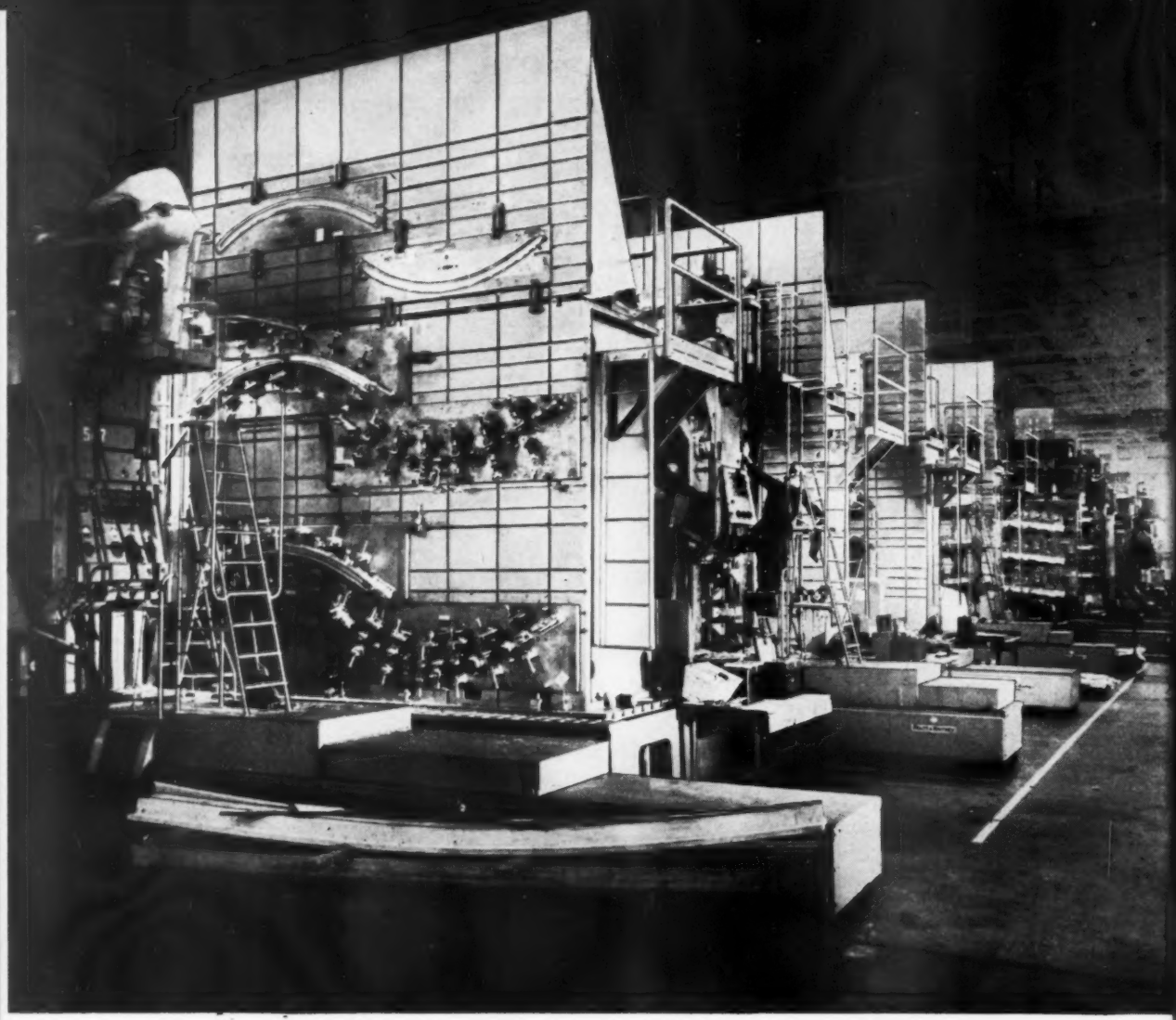
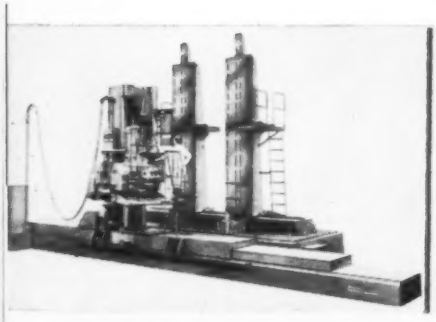
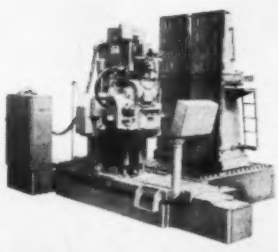
CIRCLE INFORM-A-GRAM KEY NO. 15

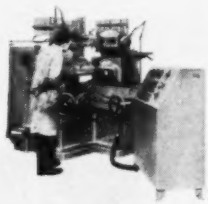


GIANT

shape the future





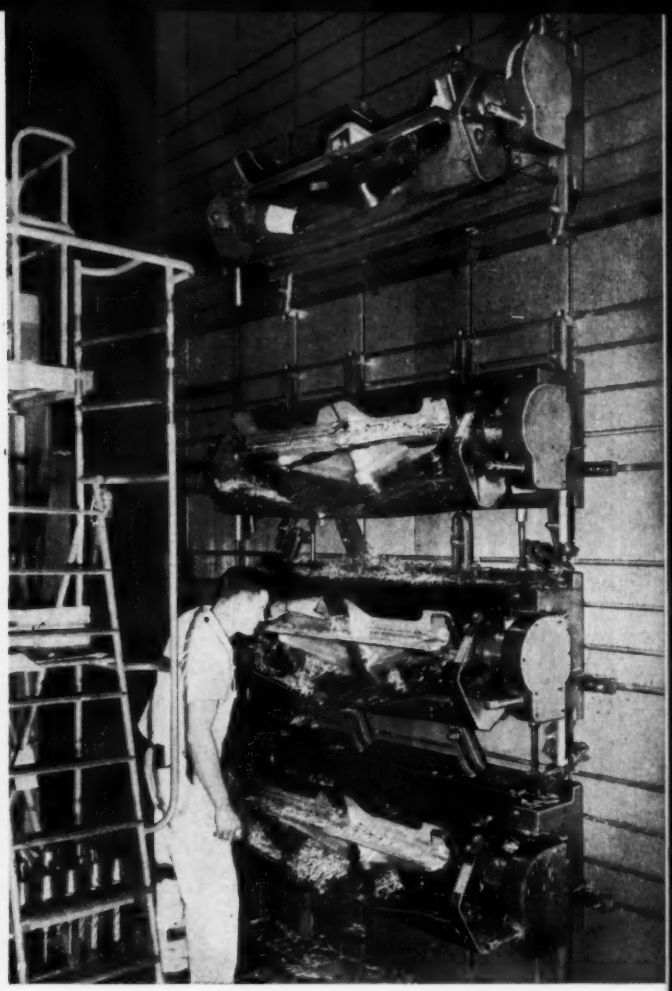


MULTI-MILLION DOLLAR PLANT... OR SMALL SHOP—There's a complete line of Pratt & Whitn KELLER Machines with models to handle *every* work size profitably.

TYPE BG-22—A big machine with capacities to 20′ x 7′. Single and 3-spindle models.

TYPE BG-21—Two standard sizes: 5′ x 2½′ and 6′ x 4′. Single and 2-spindle models.

TYPE BL–Smallest KELLE with capacity of 36″ x 20 Single and 2-spindle model



The use of two and three-spindle KELLERS provides rapid output geared to tight schedules. One noted manufacturer is counting heavily on KELLERS to help produce 150-foot airliner wings on a five-a-month basis and fill $90 million worth of orders.

Augmenting the already great versatility and productivity built into all KELLER Machines, Tool Engineers have developed ingenious trunnion fixtures (like those shown in the adjacent picture) that make it possible to re-position the components quickly for several successive machining operations . . . *without* production stops to remove the work and change fixturing.

KELLERS

of jet age production

These on-the-job scenes taken in the plant of a leading aircraft manufacturer typify the swing to KELLER throughout the Aviation Industry. To provide the maximum strength-with-lightness necessary to withstand the terrific stresses of jet age flight, increasing numbers of large, complicated components are being forged as single units and then machined over their entire surface. And making it possible to mill accurately all the complex, 3-dimensional shapes involved — on an efficient, production basis—are these rows of Pratt & Whitney BG-22 KELLER Tracer-Controlled Milling Machines . . . powerful, versatile giants that handle a wide variety of large workpieces.

GET THE FACTS . . . See how PRODUCTION MILLING with a Pratt & Whitney KELLER Machine can help improve your product performance and cost picture. Write for fully illustrated circulars, stating your work size ranges . . . or phone the Pratt & Whitney Machine Tool Specialist in your area.

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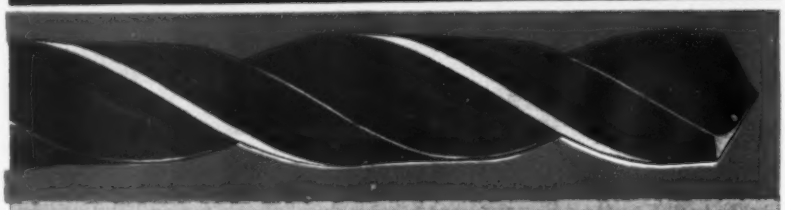
Chicago Latrobe

High Speed Drills



THE QUALITY THAT DELIVERS

greater cutting mileage!

SERVICE YOU CAN COUNT ON TO

eliminate down time!

Virtually all high-speed drilling jobs can be done by an in-stock Chicago-Latrobe Drill. So whatever your needs—look to Chicago-Latrobe. You'll find their line is complete, their quality tops, and their service unexcelled.

Order Chicago-Latrobe tools from a *service-minded* Industrial Distributor in your area.

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DOUBLE CIRCLE TOOLS

DRILLS · REAMERS
COUNTERSINKS · COUNTERBORES
CARBIDE TOOLS · SPECIAL TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Talk of Month from Page 13

and the mean value. The accuracy and economy of this procedure has made is possible to investigate many engine types which would normally be neglected; and the ratio of 1/20 for the computer time as compared with previous methods has been equalled or exceeded on every problem investigated.

THE LINE FORMS ON THE RIGHT

By this time news of the bonanza had got around, and work began pouring in from all directions. Torque converter blade shapes, converter performance, structural design problems — everything was thrown at the accounting machine, and ultimately the bank of specially wired control boards gave the poor thing indigestion. By good fortune we were able to get one of the first of the new card-programmed calculators, and things began to look up. Actually the C.P.C. equipment did not come a day too soon; for we were in the midst of our first development of a gas turbine passenger car. On this project the customary back-log of experience did not exist; and the amount of preliminary technical analysis was truly appalling.

Chrysler Corporation was the first to demonstrate the installation of a successful gas turbine in a passenger automobile. By successful we mean that which fulfills the requirement of an automotive application; a power plant which has the flexibility, the control, the safety and above all the efficiency and economy of the highly successful automotive reciprocating engine. We became convinced many years ago that at the present stage of development of materials for turbine power plants, success in an automotive application could only be realized by an almost complete recovery of the exhaust heat. Early in our efforts to solve this problem, however, we detoured from the automobile application to an aircraft propeller type regenerative gas turbine. The heat exchanger involved was quite successful and resulted in a power plant efficiency which was comparable to a reciprocating aircraft engine at 70% potential engine power.

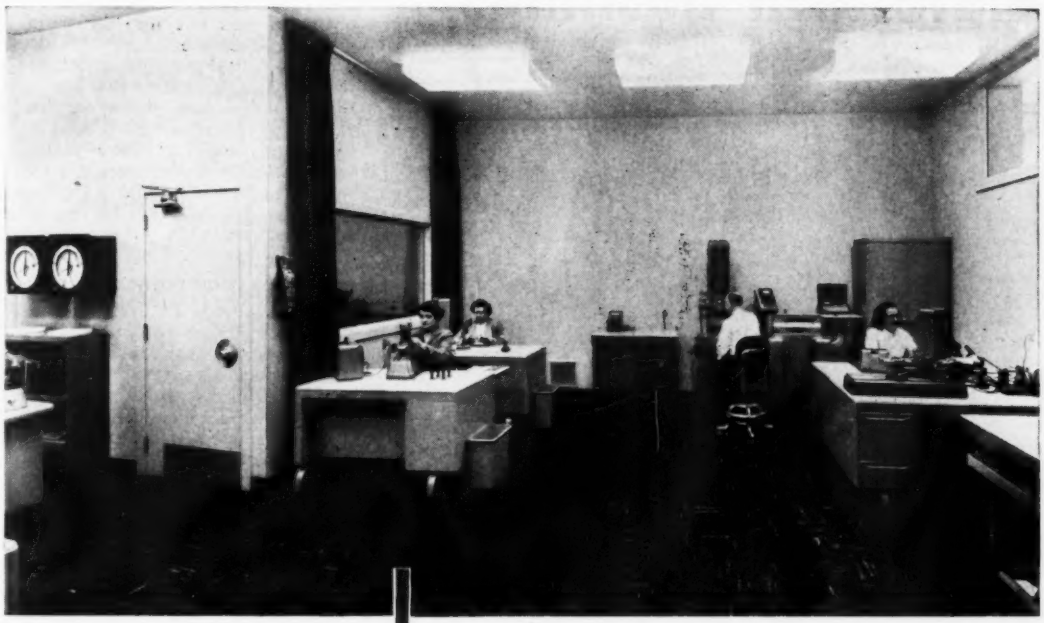
Although this power plant fulfilled the early expectations and accomplished the predicted performance, when we returned to the automotive job we realized that our approach to the heat exchanger problem would have to be radically different.

THE COMPUTER MEETS UP WITH THE GAS TURBINE

We were forced to this realization when our early calculations showed that a heat exchanger using conventional techniques and large enough to make the turbine competitive with the reciprocating engine, at the 25% to 30% normal load factor of an automotive engine, would fill a comfortably sized house

THE ELI WHITNEY METROLOGY LABORATORY

Your NEW Auditing Source For Dimensional Standards



For a more comprehensive account of the facilities and capabilities of the Eli Whitney Metrology Laboratory, request Bulletin ML-1-56 from The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 20.

American industry now has a new auditing source for dimensional standards at all precision levels.

In a maximum controlled environment—using instruments similar to those of the leading national standards laboratories of the world, the Eli Whitney Metrology Laboratory offers the following services:

1 Calibrate and Certify:

- Dimensions of gage blocks, mechanical components and fixed size master gages including thread gages and threaded parts.
- Flatness and surface finish of optical true planes.
- Material hardness.
- Fineness of textile fibers.
- Circularity and graduations of precision circles—also circularity of manufactured components.
- Boundaries of contoured masters.

2 Provide a counseling service for the development of industrial dimensional control and gage surveillance programs.

GOLDEN ANNIVERSARY HEADQUARTERS

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CIRCLE INFORM-A-GRAM KEY NO. 19

NEW

PEM self-clinching template drill bushings

Save time . . . . . Cut costs

For faster, easier installation in thin gauge aluminum or cold rolled steel templates. (one third conventional thickness)

Pay for themselves in assembly savings. Only one hole is required for each bushing—the hole to be bushed. Then, simply drop bushing in hole and squeeze into place.

Self-clinching, PEM Bushings are compression mounted and positively locked into position—one or several at a time.

Round, one-piece, hardened steel precision units—not assemblies. Require no indexing or nesting; No tabs, straps or other outboard supports; no locating, punching or drilling and countersinking of rivet holes; no riveting, hence no danger of "cocking" during riveting.

No special machinery or skilled labor required.

True alignment and center distances are automatically secured by piloting effect of leading edge of shank and interference fit.

High torque and pull out resistance are provided by back-tapered shank and corrugated clinching ring.

Complete line for drill sizes from .052 to .500

PENN ENGINEERING & MANUFACTURING CORP.

Doylestown, Pennsylvania

Write for literature ***Ask for trial samples***

PEM

CIRCLE INFORM-A-GRAM KEY NO. 20

trailer. We therefore threw away our preconceived concepts and started out on an entirely new approach. This approach would have been almost impossible without a fast digital computer.

A number of designs were conceived but even the exploration of a single design required the exploration of over 80 combinations of the variables involved in order to obtain the optimum, and in this case the optimum was not just desirable, it was an absolute necessity. Even with the fullest possible utilization of the digital computer the job took nine months and since our usual ratio is 40 to 1 in comparison to longhand and desk calculator methods, we all would have been dead and buried before we could have found out even the direction of the trend by "hand" methods.

DIVIDENDS FROM COMPUTATIONS

An unforeseen but very real dividend from these computations was realized as soon as the first experimental parts designed according to the calculations were put on test. The parts looked good, they had been fabricated with extreme care and the test setup was in accordance with our best practice, but the small sample of heat exchanger so tested was a miserable failure. It was not even as good as the conventional unit on which we had had years of experience. But none of us doubted that the error was either in the fabrication or in the test setup because we knew that the mathematical analysis of the unit had been so completely covered and our basic assumptions were so easily provable, that we turned immediately to improving our fabricating techniques with very successful results.

COMPUTER BREEDS CONFIDENCE

Having gone through similar disappointments many times before, and having turned to find the error in the mathematical work involved, it was a gratifying experience to find that the ability of completely exploring an entire field which had been given to us by the digital computer had made us completely confident of success in the actual component.

A similar story can be told on performance calculations for the gas turbine. By desk calculator methods a change of one variable in the rather complex analysis necessary meant a three-week delay in design progress while the calculation was made and checked. Naturally, many conditions had to be varied both during the design period and in the experimental testing which required the re-evaluation of performance. In addition, turbine wheels were analyzed for different temperature gradients and various constructions and material distributions. We have never had the time to estimate the number of man-hours saved in this

JOHANSSON GAGING EQUIPMENT

Assures You Precision to the Finest Degree to Meet Your Requirements —Backed by the Name Supreme in the World of Measurement.

GAGE BLOCKS

(JOHANSSON) and accessories.
Short deliveries. Inspection and reconditioning service available at our plant.

INTERNAL INDICATORS

(for inside measurements .155 to 24 inches) Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

MIKROKATOR

(Amplifier—for outside measurements) Graduations .0001 to .000002 or .001 M to .0002 M.

OTHER JOHANSSON PRODUCTS

Micrometers, Snap Gages, Extensometers, Dynamometers, Hardness Testers, Surface Finish Indicators, Interferometers, Plugs, Rings and Special Gages.

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AUTOMATIC SIZING

For Your Production Machines, by Use of the New CEJ-DELTAMETER Gage

Measuring accuracy: from ± .000,005" to ± .000,1"

The CEJ-DELTAMETER is a pneumatic measuring instrument intended for automatic machine control and for sorting of mass produced parts.

With the application of the CEJ-DELTAMETER to your machines you will get:

- More accurate and uniform products.
- Less rejected parts.
- Less inspection as the parts are already inspected when leaving the machine.

The CEJ-DELTAMETER Gage Heads have small dimensions and can be located at "hard-to-reach places". The head is connected to the indicating dial instrument over an armored flexible tubing. The dial is 6 inches over the diameter facilitating easy reading from a distance for control.

The CEJ-DELTAMETERS are applicable to such machines as ID- and OD-grinders, Turret Lathes and Rolling Mills as well as Sorting devices and many other special built machines and measuring fixtures. There are *four different types* of Gage Heads available. The Type I when adapted to an Internal Grinding Machine can automatically control the grinding operation to size of the part and even dress the grinding wheel before the finish grinding. When the part is ground to size the machine is automatically cut out. Other tyes are A, O and S applicable on turret lathes, O.D. grinders and for special applications.

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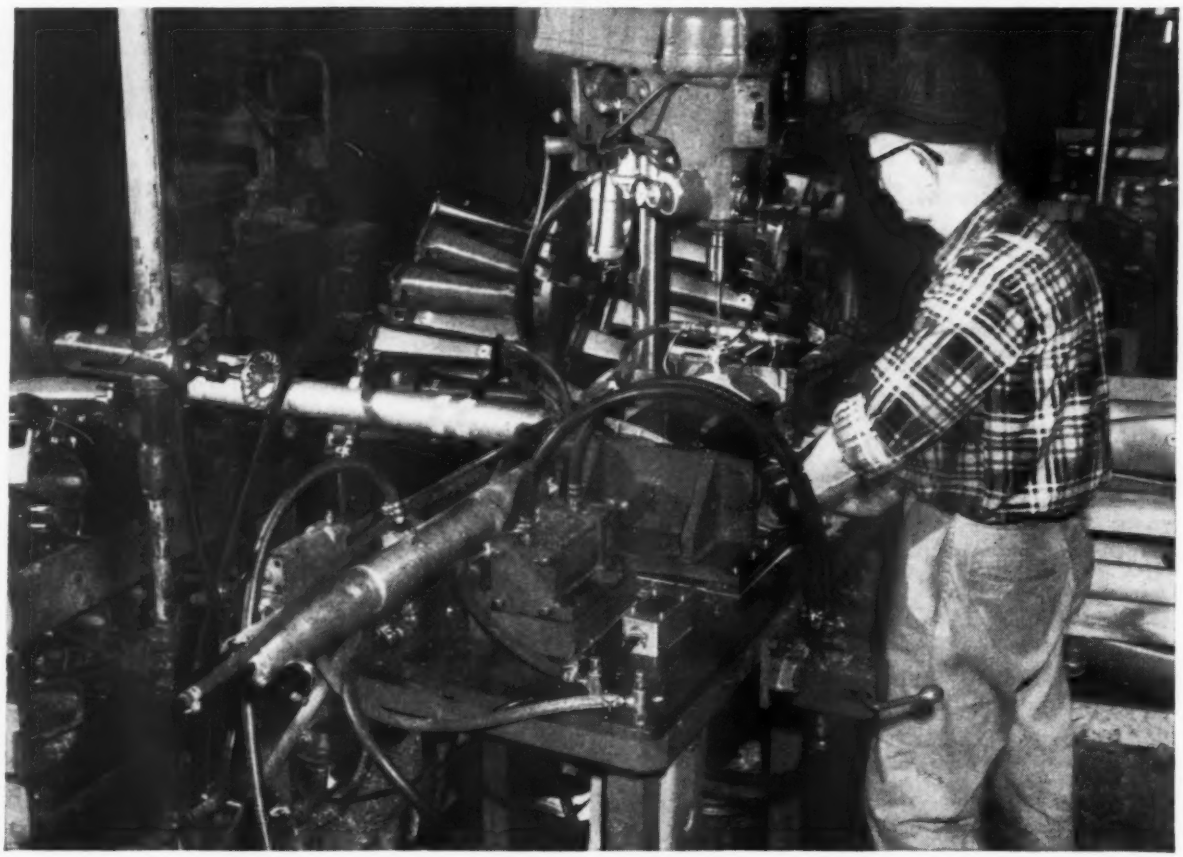
CIRCLE INFORM-A-GRAM KEY NO. 21

Gardner-Denver... Serving the World's Basic Industries

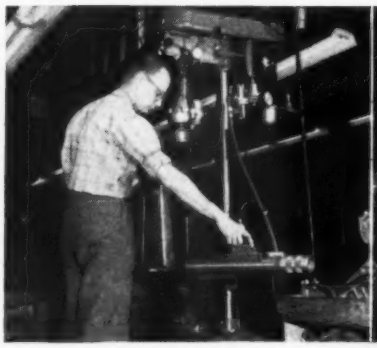


At this drill press station, four Keller Tool "Airfeedrills," with five-, six- and eight-inch strokes, drill four extra holes in the workpiece as the drill press finishes one hole from above.

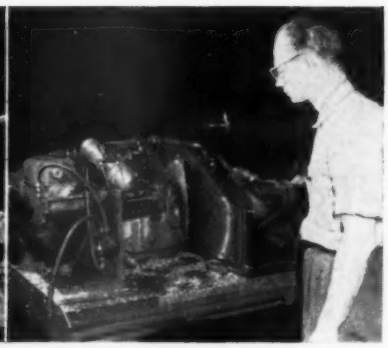
Drills 4 extra holes . . . production time: zero!

Production men have found a new and ingenious way to complete drilling operations with no extra production time. When a workpiece has to be jigged or put in a drill press for some operation, they mount Keller Tool "Airfeedrills"® in position to perform additional drilling, reaming, tapping or facing operations at the same time. The illustrations on this page show how it's done.

Ideal for mounting in multiple units or as single outriggers, Keller Tool "Airfeedrills" and "Airfeedtappers"® perform complete work cycles automatically—at the press of a button. Further details are available in Bulletin 92.



Operator presses a button—and the Keller Tool "Airfeedtapper" provides a free tapped hole while standard machine taps three holes at top of piece.



While special multiple head unit drills eight holes in the work, an "Airfeedrill" mounted at rear of fixture step drills a "free" ¼-⅜-inch hole at an odd angle.

GARDNER - DENVER

KELLER TOOL division, Grand Haven, Michigan

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

CIRCLE INFORM-A-GRAM KEY NO. 22

one aspect alone but it certainly is very large.

PUTTING THE BRAKES ON THE COMPUTER

Other problems outside the turbine field helped to establish the power of the computer. In our efforts to equalize brake shoe deflection to reduce wear we investigated 5000 designs in each of several sizes — a task so formidable it would never have been thought of in the absence of the computer. Engine test data reduction became a ten-minute task, so that no delays in the test schedule occurred. Algebraic equations of considerable complexity were tossed off in minutes; but here the C.P.C. computer met its Waterloo.

After a honeymoon of nearly two years it became apparent that the speed and memory capacity of the C.P.C. equipment was inadequate for the differential equations we now wanted to handle. The newer Type 650 machine with magnetic drum storage has now been installed, and has greatly increased our capacity to tackle involved problems.

FROM BRAKES TO HYPOIDS

As we have grown in experience with the new computer more difficult problems have been added to our repertory. Naturally, computations which provide drastic time savings are high on our list. A recent important example is the computation of hypoid bevel gears for rear axles This computation is one of extreme complication and tedium; and the period of several weeks usually required for its completion has acted as an artificial barrier to the selection of optimum axle ratios. We have recently succeeded in programming this computation; and the reduction in time to ¾ of an hour has resulted in much better coverage of one of our basic problems. Of such apparent trifles is progress constituted.

WRAPPING THE COMPUTER AROUND THE WINDSHIELD

Another recent headache is the compound curvature of windshields. The optical properties of these components introduce problems of serious importance; and we are busily engaged in determining an analytical expression for the curvature of the glass, in the hope that the wearisome ray-tracing computations may be reduced to manageable proportions. This problem has not yet been reduced to submission; but the impact of a solution on the design of aspherical optical components makes the effort well worthwhile.

One of the interesting traits of our computers is the evidence of their universal tastes. They are devoid of prejudice; and never show resentment, as human computers so frequently do at being transferred from their field of special interest. We had reason to observe this recently

Through STANDARDIZATION, you now can build your own CUSTOMIZED conveyor to meet your own individual needs. The MAY-FRAN components . . . mass produced . . . can be assembled into virtually any type of hinged-steel conveyor for the handling of stampings, formed metal parts, forgings, automotive scrap, chips and turnings.

Straight sections . . . concave or convex sections . . . take-up and discharge-end sections can be furnished to meet specific requirements of belt width as well as load bearing and volume capacities.

These pre-fabricated units are available rapidly and at low-cost. You save money many ways with MAY-FRAN standardization because . . . conveyors can be assembled by your own plant personnel . . . conveyors can be modified in any way when production needs change . . . conveyors can be dis-assembled and moved to other plant locations.

7126-MF

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ENGINEERING, INC.
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CIRCLE INFORM-A-GRAM KEY NO. 23

my name is

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in charge of our

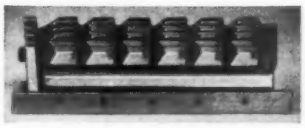
"Prove It"

division at elox

My division will actually machine parts for you. Not just a single sample, but enough production runs to provide a true evaluation of what Elox Electrical Discharge Machine tools can do in your plant. Tungsten Carbide tipped single point tools, forging dies, die casting dies and Tungsten Carbide form tools will be machined at a cost we guarantee impossible to duplicate except with Elox E.D.M. I've been able to prove to hundreds of alert concerns that these jobs can be done better, faster and less expensively with Elox than by any other method.

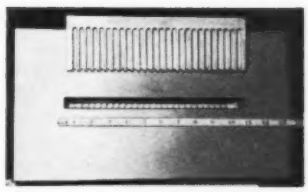
WE SAVED 19 MINUTES

grinding this single point tungsten carbide tip boring tool.



WE SAVED 16 HOURS

plus 9 different operations on this form grinding of a carbide broach.



WE SAVED 379 HOURS

on the machining of this die casting die.

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elox corporation of michigan*

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*T.M. Reg.

CIRCLE INFORM-A-GRAM KEY NO. 24

when the computers were introduced to the nuclear field. The computation of the critical mass of reactors was made with the same dispatch as a routine harmonic analysis, and the problem of reactor flux distribution caused no more disturbance to the equanimity of the machine than the simplest stress problem. With such servants to aid us we shall have little excuse, indeed, if we fail to produce at least some of the miracles expected of us.

UNEXPECTED PROBLEMS

The new magnetic storage facilities have greatly increased the capacity of our computers, but with this increased capacity have come unexpected problems. A set of thirty-two simultaneous equations can now be handled quite readily; but the rounding errors of such a set vitiate the accuracy of the computation to the point where we may well suspect the significance of the answer. Truncation errors are very difficult to fit into the theory of probability; but evidence seems to exist that we lose eight significant figures in solving a fifteenth-degree equation. It is apparent, therefore, that great care must be taken to avoid a sense of false well-being when our more powerful computers pour out a long string of figures. Our own motto is rapidly becoming "Festina lente".

In recent months many computers and their operators have been engaged in extra-curricular activities, authorized and otherwise, since there seems to be a desire on the part of some computer people to prove versatility of their methods in all fields. The result of one of these deliberations attained wide publicity in this part of the country; since it predicted that the Detroit "Tigers" would win the American League pennant. When the audible guffaws had died down there remained in many minds a suspicion that such predictions were eminently feasible.

HOW ABOUT THE DETROIT "TIGERS"?

Our own people became interested in the problem; and from the published statistics for the last six years they have determined regression coefficients for "runs for", "runs against", "earned run average", "team batting average", "total home runs" and "team fielding average". From these data it was found that of the twelve actual pennant winners, nine were statistically entitled to their position; and of the twelve statistical champions every one finished either first or second.

With the foregoing information as a basis it was decided to predict from the first forty games of this year how the teams would finish the season. There is something fatalistic in the make-up of anyone who makes sports predictions; and the fact that his ears will inevitably be pinned back never seems to deter him. Therefore, for the benefit of our

HOW TO KNOW ALL THE ANSWERS . . .
WHEN THE QUESTION IS Marking!
MARKING MACHINERY
Production efficiency and economy is assured with Parker recommended, Parker built marking machines—standard or custom.
MARKING TOOLING
Parker marking specialists will suggest, develop, deliver the tooling and fixtures your job and equipment demands to keep production up, costs down.
MARKING METHODS
The Parker design and engineering staff stands ready to make your "impossible" marking applications routine, routine applications far more efficient.
When marking speed . . . adaptability . . . precision . . . legibility . . . or economy is a problem, Parker has the answer. Let Parker put a marking expert in your plant, let 85 years of marking experience help YOU. Send information on your marking equipment needs for prompt advice—ask for the helpful Parker catalog, too.
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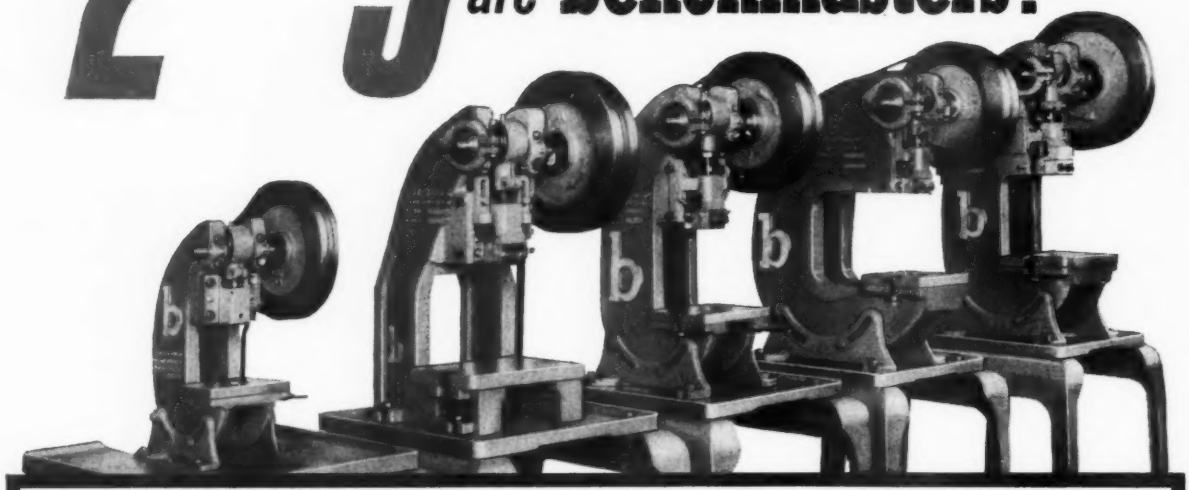
CIRCLE INFORM-A-GRAM KEY NO. 25

2 out of 3 small presses purchased are benchmasters!



That's a fact... out of all small punch presses purchased 2 out of 3 are supplied by Benchmaster!

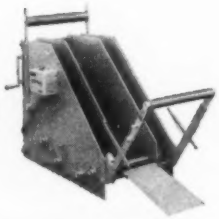
Being first choice by so wide a margin is no accident. First, Benchmaster builds small presses in 3 *distinct capacity ranges*... 2, 5 and 8 tons. Second, consider the various models available... *plain inclinable models, backgeared types, deep throat presses, fixed bed gap frame types, half presses, multiple ram presses and special stroke models!*

Add to this the complete range of Benchmaster Accessories... AUTOMATIC DIAL INDEX FEEDS, AUTOMATIC FRICTION ROLL FEEDS, ROLL STRAIGHTENERS, KOIL KRADLES, BARRIER TYPE GUARDS, CHUTE TYPE PRODUCTION PANS, ETC. And remember, Benchmaster's acceptance is world-wide—wherever you go there's a Benchmaster—and Benchmaster service!

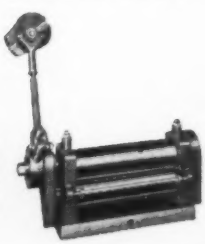
When buying new presses choose the winner *First in Sales, First in Quality, First in Economy!*

Wherever there's a press operation, this Benchmaster Equipment will cut costs, save time!

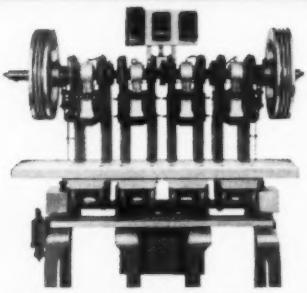
BENCHMASTER STRAIGHTENERS—(Shown in combination with Koil Kradle.) Adjustable, power driven rolls; removes kinks—straightens out coil stock before feeding to feed mechanisms or to press. Many sizes, write for details.



BENCHMASTER KOIL KRADLES—Automatically supplies a slack loop from which any machine can draw. Overcomes inertia of heavy coils—easier loading. Many sizes. Ask for data.



BENCHMASTER AUTOMATIC FRICTION ROLL FEEDS—A low cost roll feed made especially for all small presses. Has automatic roll lifters, feeds almost any material. Two models: 0-3" and 0-6" cutoff. 3, 5, 7 and 9" roll widths.



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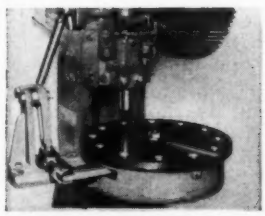

BENCHMASTER DIAL INDEX FEEDS—Links with ram, automatically indexes, placing new station under ram with each stroke. Up to 6000 strokes per hour. Cuts labor—makes your press operations almost automatic. 12" or 15" diameter tables, up to 24 stations.

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CIRCLE INFORM-A-GRAM KEY NO. 26

public among the baseball fans we must publish our findings. If our computer knows its business the American League results will be as follows: New York, Cleveland, Detroit, Boston, Chicago, Baltimore, Kansas City and Washington. In the National League the teams will finish: Milwaukee, St. Louis, Pittsburgh, Brooklyn, Cincinnati, New York, Philadelphia and Chicago.

CHARLEY-HORSES UNPREDICTABLE

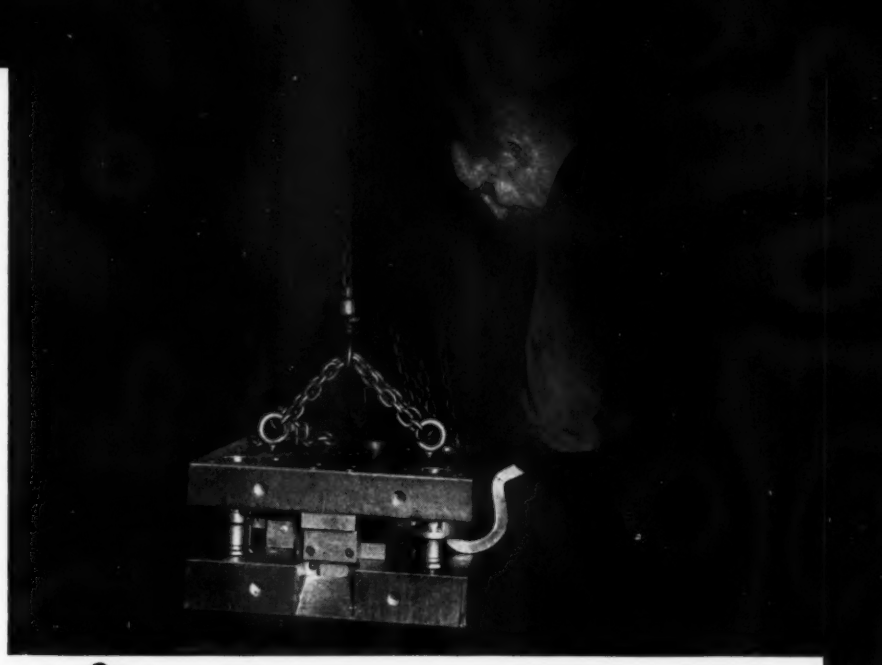
Now the last 110 games of this hypothetical schedule were played in a six-dimensional continuum of the computer's own choosing; and whether the results bear any relation to what will happen at Briggs Stadium or Ebbetts Field only time will tell. After all, any computer has its limitations. It cannot, for instance, predict a late-season epidemic of charley-horses, or that the star short-stop will start indulging too heavily in the variety of blood plasma which comes bottled in bond. Nevertheless it is apparent that, if it were worthwhile, these procedures could be refined to the point where they could predict with the necessary accuracy baseball results or any other events of interest.

It is no secret to this audience that eighteenth-century gamblers subsidized quite heavily the foundations of the theory of probability. Who knows but that their twentieth-century counterparts won't become ardent patrons of our computer laboratories.

The attainment of a usable answer is not the only benefit from the introduction of a problem to the computer. Frequently this procedure provides heuristic clarification of a principle previously obscure. We recently had occasion to investigate a diffusion problem over a wide range of two of the parameters involved. In this process functions were required which had not previously been set up for the machine, and considerable time was expended in programming before we were assured that the computer had been given accurate and adequate instruction. The first analysis of the ensuing data was made by a man not previously acquainted with the problem, who immediately realized that the work could be reformulated into a much simpler type of computation capable of accomplishment in a few minutes on a desk calculator.

TANGLED JUNGLE VS DIRECT PATH

Thus, constant vigilance must be used to avoid letting the power and capacity of the computer lead one through tangled jungles of computation, when a direct path may be available at the price of a little searching. The necessary catalyst in all this work is the brain of man, forever searching to escape from work, or the easiest way to do it, if escape is impossible. Castigliano is given the credit for formulating the



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...BEFORE the die gets in the toolroom

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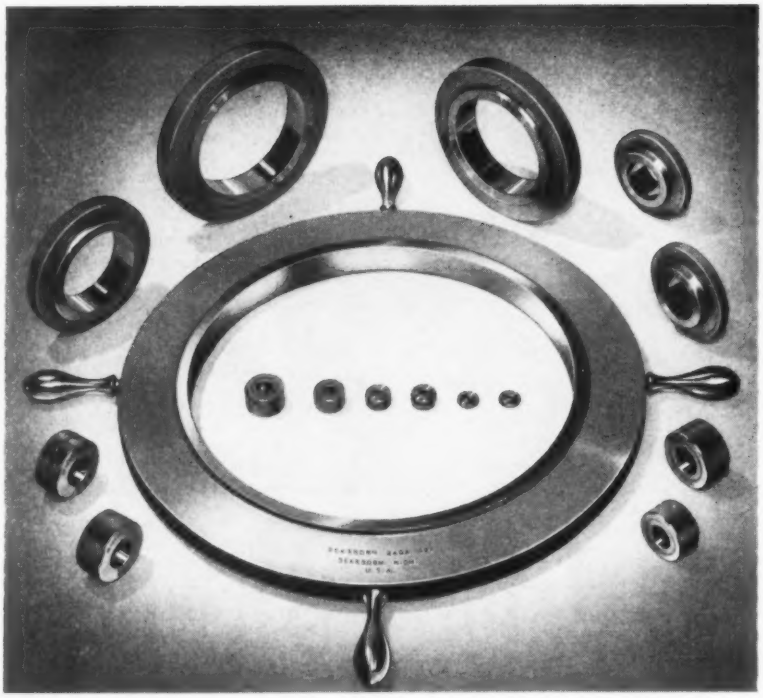

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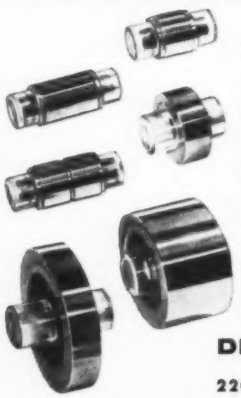

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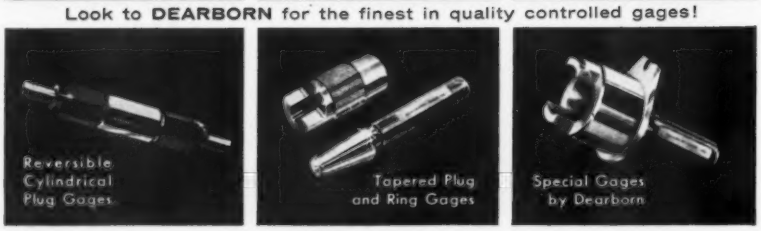

CIRCLE INFORM-A-GRAM KEY NO. 28

Principle of Least Work; but man has used this principle instinctively since he first appeared on this earth.

So far we have discussed our experience with digital computers when engaged in the point-by-point computations so typical of numerical analysis. However, we are being forced by circumstance into a more active utilization of non-linear mechanics. For this type of problem we feel that the analogue computer has definite possibilities; and at the moment we are trying to assess its proper sphere of influence.

In general, there are two types of problems for which the analog computer is ideally suited. One is the problem involving complex differential equations which cannot be rationally solved by long-hand methods even when the equations are linear. The other is the type of problem which is readily solved by long-hand when the equations are linear but becomes impossible to handle rigorously when non-linear elements are introduced.

Unfortunately, most real situations involve non-linear elements, and the use of assumptions to obtain linear equations capable of long-hand solution can readily invalidate the results. Therefore, the ability of the analog computer to simulate any real relationship between variables is one of its greatest attributes.

LONG-HAND NOT FOR VIBRATIONS

If we take as an example a simple vibrating system of one degree of freedom, we know that it is readily solved long-hand as long as viscous damping is assumed. This gives us a convenient linear differential equation. Actually, very few practical vibrating systems even of an elementary type involve pure viscous damping. The fluid damping if present is not truly viscous and additional damping elements of the complex or coulomb type are quite often present. Any attempt to introduce these real damping factors immediately leads to an equation which can no longer be rigorously solved long-hand. In contrast, these real conditions can be readily simulated on an operational analog computer and answers obtained in one day, including the setup time.

To extend the illustration, let us consider one of the complex problems that we face today, namely, to obtain a complete understanding of the dynamics of a road vehicle as it affects the motion of the passengers. It is possible to simplify the problem to the extent of considering only vertical and angular motions in one plane but even then the complete system involves eight degrees of freedom when the sprung and unsprung masses and passenger masses are taken into account. The eight simultaneous differential equations are quite readily written but without the analog computer we can see no way of making reasonable progress to-

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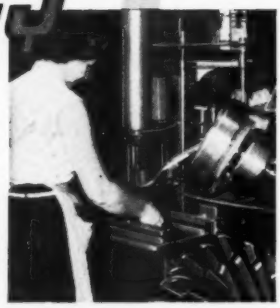

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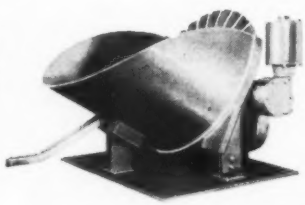
Vibratory type, to select and feed smaller fragile parts



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with stationary ring cover, for heavy-duty, large production runs

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CIRCLE INFORM-A-GRAM KEY NO. 30

ward their solution.

As I just pointed out, it is vital that the real characteristics of the elastic elements and damping elements be accurately simulated and these are all invariably non-linear. Yet this complete problem can readily be handled on an operational analog computer of moderate size requiring no more than 40 or 50 amplifiers, depending on the amount of auxiliary equipment available to generate non-linear functions.

TAKING THE BUMPS OUT OF THE ROAD

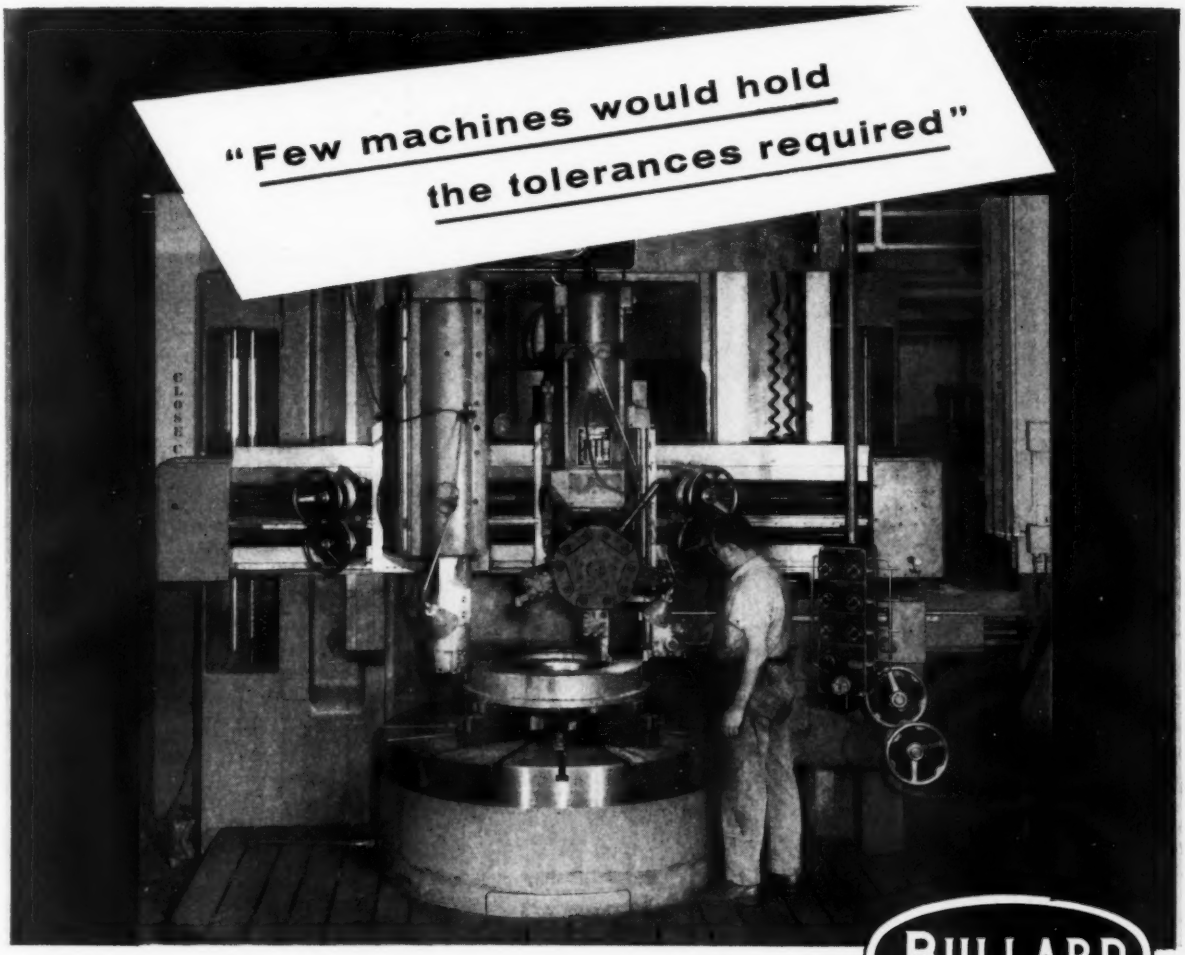
Many of you are familiar with the process that is used in the automotive industry to achieve a satisfactorily riding automobile. It has been the subject of many technical papers and many learned professional treatises, so that it would be inappropriate if not impossible to completely review the method here. There are so many variables in the ride alone, and so much extensive instrumentation is required that the development of even a single model becomes a very lengthy and expensive procedure.

To the ride problem may be added sway control, roll control, transverse, longitudinal and vertical shake, and the overall steering, handling and control response of the vehicle, all of which affect the safety and comfort of the driver and his passengers. This problem becomes more and more complex every year due to higher and higher standards of performance and due to the steady progress of the mechanical components involved.

Consequently, the development of a safe and comfortable riding vehicle has become a combination of high scientific effort and the application of what can only be called the highest type of artistry. It is in the field of the "art" in which the computer can make such tremendous contributions.

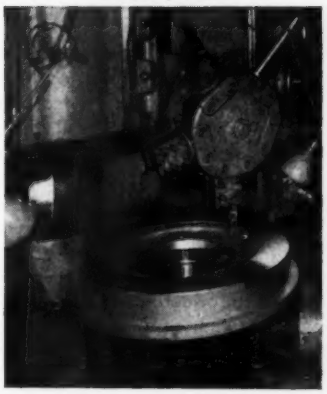
Very definite progress has been made at Chrysler in placing this problem in a mathematical framework. Certainly we have been aware of it for many years and our first ride analysis analog computer was built in 1938 and 1939. It represented at that time an oversimplification of the problem, but it nevertheless indicated the course we wished to follow and it was of very real assistance in the solution of the immediate problem then facing us.

We felt then, however, and do now that the development of computation equipment, although of scientific interest to us, is not our job. Others have developed competence in this field for good, sound commercial reasons and pure scientific progress is likewise assured. Therefore, we stand ready to utilize this progress as one of the most valuable tools that we have ever had in the scientific progress of personal



This statement by Mr. R. P. Feiser, Industrial Engineer of the York Corporation, York, Pa., is one of the reasons for their purchase of a 66″ Cut Master, V.T.L., Model 75 for the machining of a rotor support for their turbomatic compressor.

Mr. Feiser further states that "the 66″ Cut Master does this machining at a saving of 40% over any previously used machine. In addition, the pendant control and power swiveling turret head are a great convenience in operation — the result is a low operator fatigue factor. Also, the York Corporation has experienced low maintenance costs on a 60″ Vertical in operation since 1928 and a 36″ Vertical in operation since 1937."



CIRCLE INFORM-A-GRAM KEY NO. 31

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This NEW Buckeye abrasive tool is available in five speeds, comes complete with dead handle and guard. If you'd like more information, just write—now—for our Catalog A-10. If you'd like to see what this new tool can do on your work, just tell us so and we'll make the necessary arrangements—without obligating you at all.

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transportation.

One of the most convincing demonstrations of the ability of an analog computer to simulate ride motion of an automobile was made some time ago by the University of Michigan research group. They found it essential to prove that the analog computer predictions are completely valid and truly simulate the action of a vehicle on the road. They invited our cooperation, which we were very happy to give them, since we were equally desirous of seeing such a demonstration performed.

Accordingly, we submitted to Willow Run the complete set of pertinent specifications of a given automobile for which road test accelerometer recordings were available. In order to simplify the problem to some extent, the records we furnished were those taken with the passengers on solid wooden seats, which eliminated the four degrees of freedom associated with the vertical and angular vibrations of the front and rear passengers on the normal elastic cushions. Recordings had been taken on a series of rough street intersections, each consisting of two severe waves of 4 inch amplitude and 20 feet wave length, at a speed close to the critical value.

To make the simulation complete, some members of the University staff photographically recorded the contour of one of these intersections one dark night by rolling a wheel with an illuminated hub over the intersection. This contour was then reproduced by means of an input function generator, and fed into the computer to excite the system.

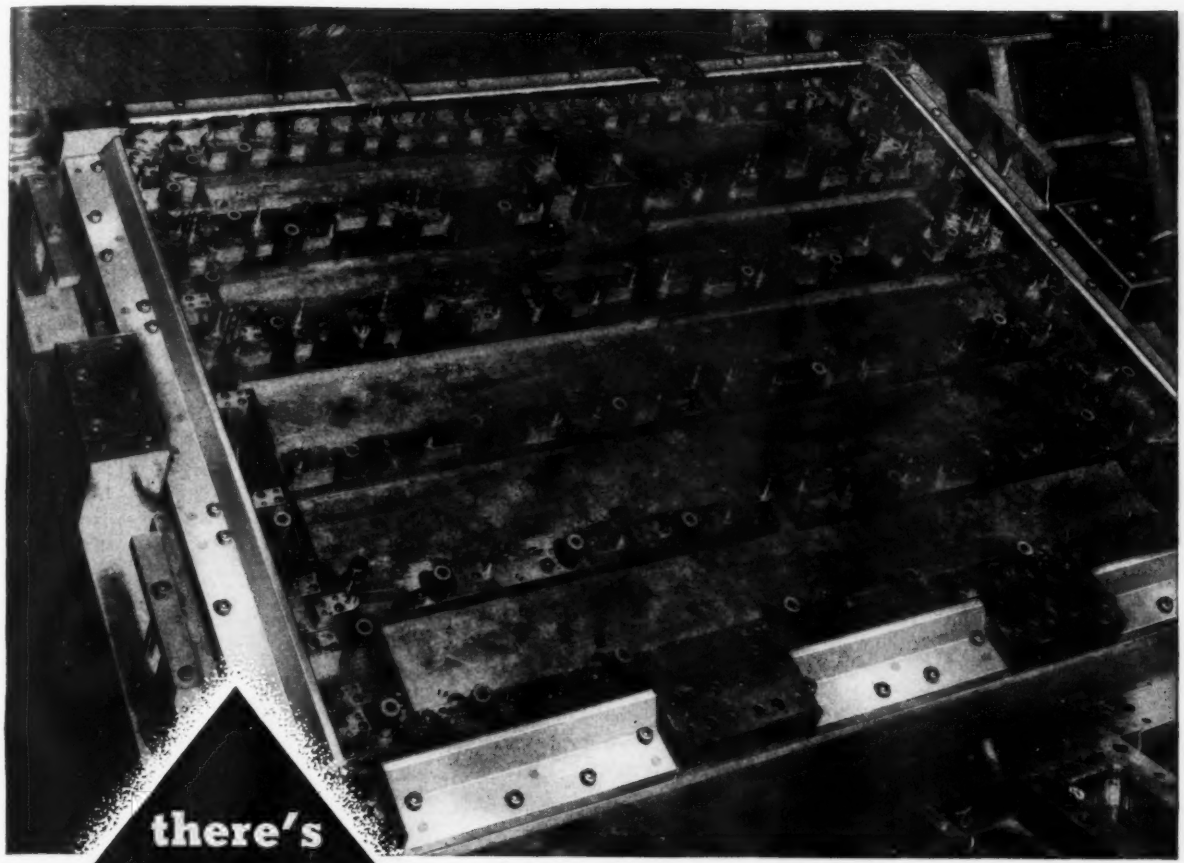
PROVING THE PREDICTION

The results showed that the analog traces and the measured accelerations agreed both in vertical motion and in longitudinal motion taken at passenger shoulder level on the car body. Moreover, slight departures that did exist between the two are not the fault of the computer but the probable effects of known factors which were deliberately neglected in the analog simulation to save time. These include a relatively small amount of friction and minor variations in deflection rates in the actual car suspension.

Thus we see that the operational analog computer not only extends the analytical approach into entirely new areas but can get results in a short enough time to be of practical usefulness. As compared with the customary experimental approach in exploring new mechanical systems, the analog computer can obviously save a tremendous amount of time and money. But, what we feel is even more important, it provides a reasonable expectation of finding the optimum combination of parameters. This is true because of the rapidity with which a full range of param-

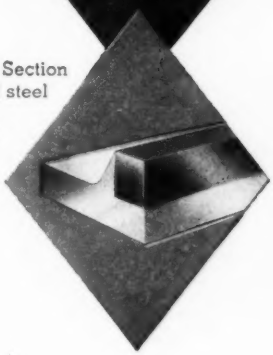
. . . Continued on Page 36

CIRCLE INFORM-A-GRAM KEY NO. 32



Photograph courtesy of the Ready Machine Tool & Die Company, Inc., Connersville, Ind. shows Ohio Knife Co. Composite Die Sections on a blank and pierce die for a 4' x 6' refrigerator inner food compartment.

there's a NEW way to build your dies



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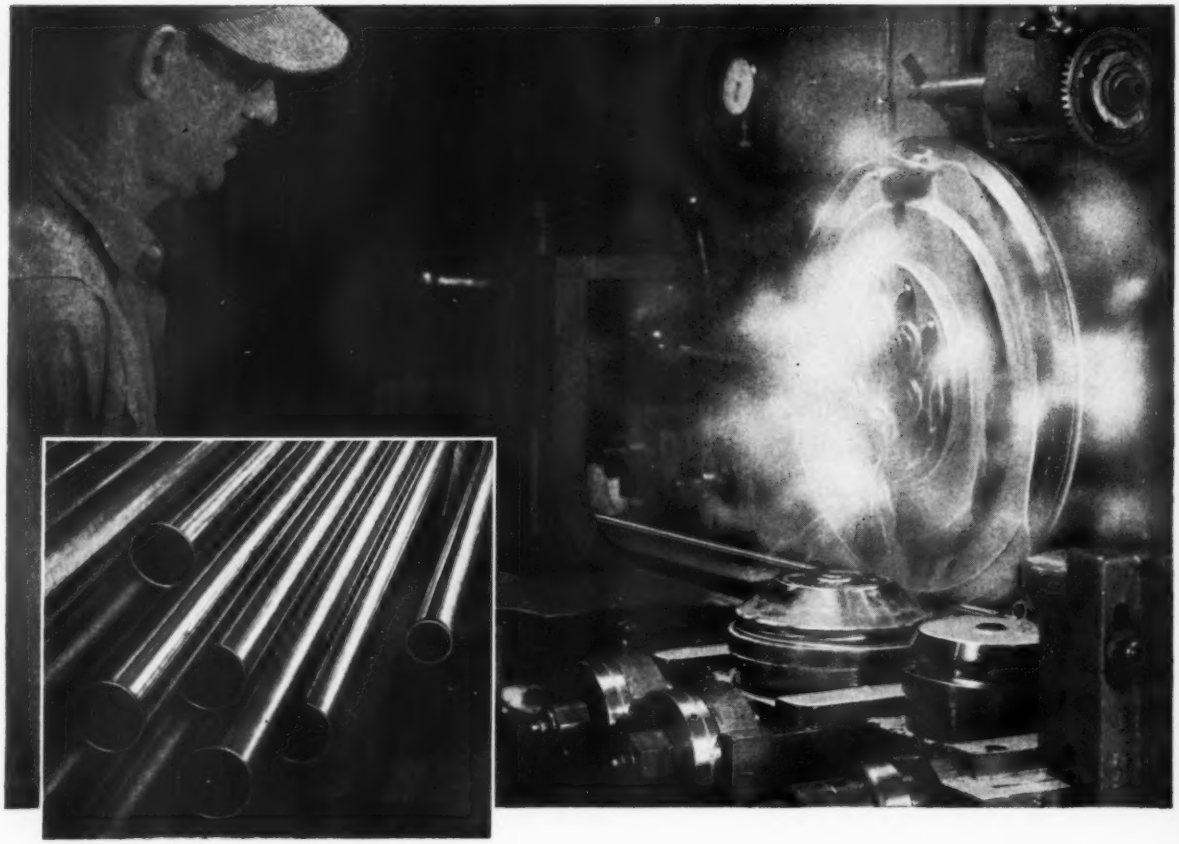

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Yoder leads the way

to higher speeds and quality at lower cost

In the short period from 1938 to 1955, the production of electric welded pipe and tubing grew from 269,000 tons to over 3,000,000 tons. This phenomenal rate of growth—over two and one-half times faster than that of the pipe and tube making industry as a whole—to a large extent resulted from a series of important improvements in tube mill design, all introduced by Yoder.

First came the Yoder rotating welding transformer, in 1938. The economic and other benefits conferred by this epoch making innovation were further augmented by other technological advances scored by Yoder in the years that followed. The result was that electric-weld pipe and tube making became the child prodigy of the fast growing pipe and tube making industry.

Latest, and perhaps the greatest, of these developments is the cold forming and induction welding at high speeds of *aluminum, magnesium, brass, nickel, monel, and other non-ferrous metals and alloys.* This process is especially economical for making light and medium gauge tubes in sizes up to 8 in. dia. More and more leading non-ferrous metal producers and fabricators are installing these mills.

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- ☐ Resistance-Weld Mills for making Steel Tubing up to 4" diameter.
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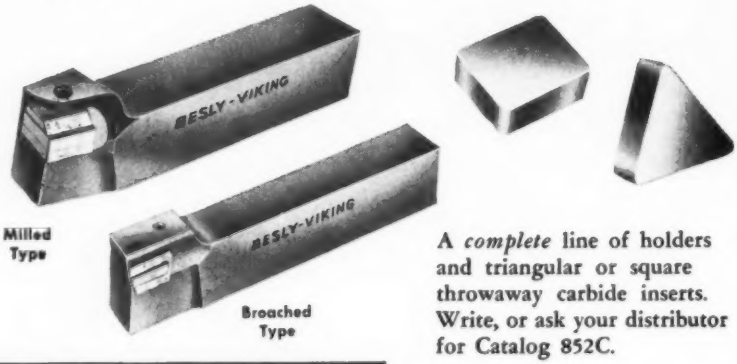
BESLY TOOL HOLDERS and THROWAWAY CARBIDE INSERTS



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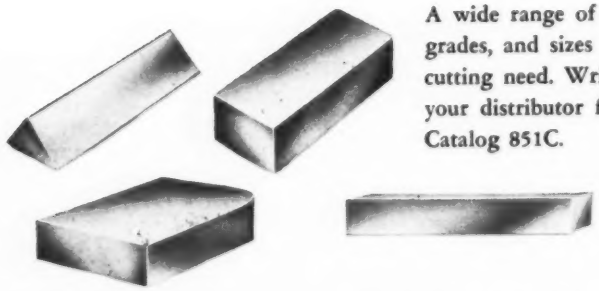

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CIRCLE INFORM-A-GRAM KEY NO. 36

. . . Month's Talk, from Page 32

eters can be explored in all their combinations and permutations.

To carry out the same process experimentally would be prohibitive in the expenditure of time and money. Consequently, it is only by happy accident that anything approaching the optimum design of a complex system is ever achieved by exclusively experimental methods.

PIN-POINTING THE EXPERIMENTAL

However, after the computer has indicated the probable optimum area, experimental work can readily be pin-pointed to achieve the practical optimum. Something should be said also for the great advantage gained by the use of the analog computer in being able to visualize directly the effects of parameter changes accomplished by the mere turning of dial controls.

Our present analog computer has been with us for less than a year, and much of this time has been spent in getting acquainted with the machine and learning its capabilities. However, it has had time to analyze the suspension of an eight-wheel ordnance vehicle with complete independent suspension and compare it — favorably, of course — with the standard eight-wheel bogie construction. The flow of air between tanks of an air-suspension system has been investigated, as well as the effect of shock absorbers with non-linear systems. Servo-control for a complete suspension system has been analyzed and found to show great promise. After five years of quiet the valve-gear problem has come up for further study; and it is our hope that the analogue computer may contribute substantially to an enduring solution.

NO PROBLEM IMPOSSIBLE

The revolution brought about by powerful computers is so new that the full implications are not yet realized. The speed of these devices changes our entire approach to problems; and whether it is the randomizing of 1000 samples for use on a coast-to-coast test or the tabulation of synthetic names for non-existent drugs we no longer consider any problem impossible. The science fiction writers have got to the point of permitting two giant computers to fight a war with each other, and take control away from their operators when the latter got tired of the business. Even the authors of serious textbooks on cybernetics have begun to draw startling parallels between the functioning of their new toys and the behavior of the human brain.

Of course the parallel is there, but why should it occasion surprise? If a man designs a machine to take over some of his functions is it sur-

. . . Continued on Page 39

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Cone was the first builder of multiple spindle automatics to provide machine users with an experimental service in the application of carbide tools.

This service is a practical means of determining the possibilities of carbide tools for production men without loss or interference with their regular production schedules.

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Specify THESE TOP QUALITY FEATURES...

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On all Air and Hydraulic Cylinders

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CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

Specify "TEFLON" WIPERS

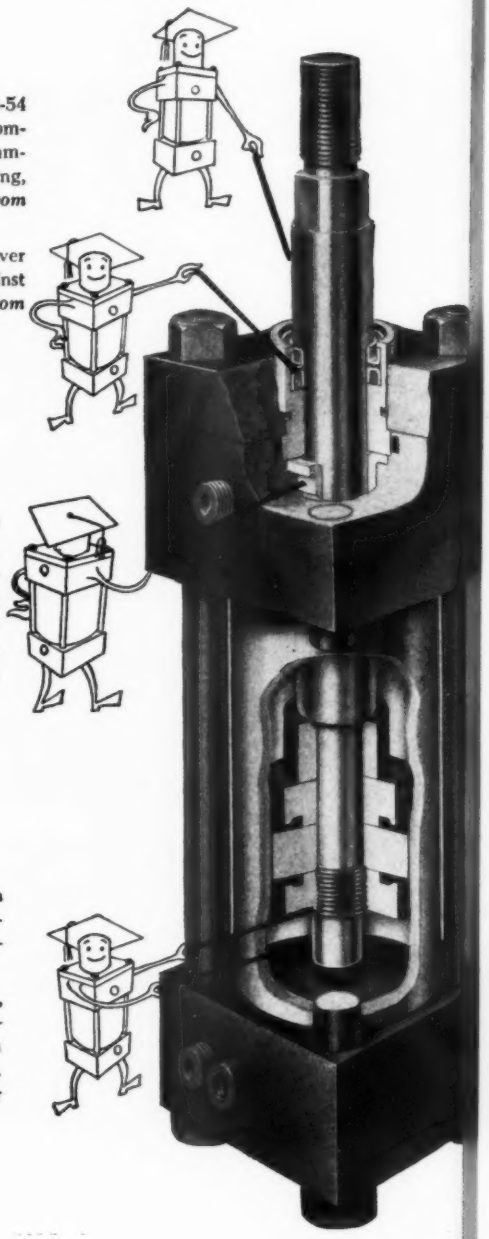
On all Air and Hydraulic Cylinders

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

Specify TEFLON HYDRAULIC ROD SEALS

On all Hydraulic Cylinders



Specify RUST RESISTANT SURFACES

On all Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)

You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request. →

To (Dept.)_____

"On all our future cylinder requirements, please specify the above quality features."

Signed_____

Title_____

See these New Features on Miller Cylinders at Miller

BOOTH #1623

METAL SHOW — Public Auditorium — OCT. — Cleveland

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MILLER FLUID POWER DIVISION FLICK-REEDY

2046 N. HAWTHORNE AVE., MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUM

. . . Month's Talk, from Page 36

prising that its characteristics should be anthropomorphic? For years we have used the contour map of a soap bubble to tell us the torsional stress distribution in irregular shafts; and the same equations turn up in the most unexpected places in every field of physical science. Surely it should be obvious that all knowledge is one, and that there is a guiding principle which makes it so.

LIFE MORE PLEASANT

The future of our civilization stretches invitingly before us, and there is room to spare for computers of ever increasing scope and power to help us in our search for knowledge and progress. But there is surely no need for concern that our machines will be capable of many things which man's unaided efforts could not accomplish. The same thing may be said of a hammer or a scissors, or any of the million devices which man's ingenuity has created to make his task less heavy and his life more pleasant.

We have created in the new computers impressive and sometimes awe-inspiring tools; but no automatic device can evaluate, electronically or otherwise, the nuances which the human brain juggles and sorts continuously during its life span. We are completely ignorant of the input signals which man's brain automatically uses; and until we can specify them precisely we cannot introduce them to our tools.

There is a sobering bit of advice in one of Kipling's works which summarizes better than I can what this short talk has been trying to say. It is the conclusion of his poem, "The Secret of the Machines":

But remember, please, the law by which we live;
We are not built to comprehend a lie;
We can neither love, nor pity, nor forgive;
If you make a slip in handling us, you die!
We are greater than the peoples or the kings;
Be humble, as you crawl beneath our rods;
Our touch can alter all created things:
We are everything on earth—except the gods.

Though our smoke may hide the heavens from your eyes
It will vanish, and the stars will shine again;
Because for all our power and weight and size
We are nothing but the children of your brain.

★ ★ ★

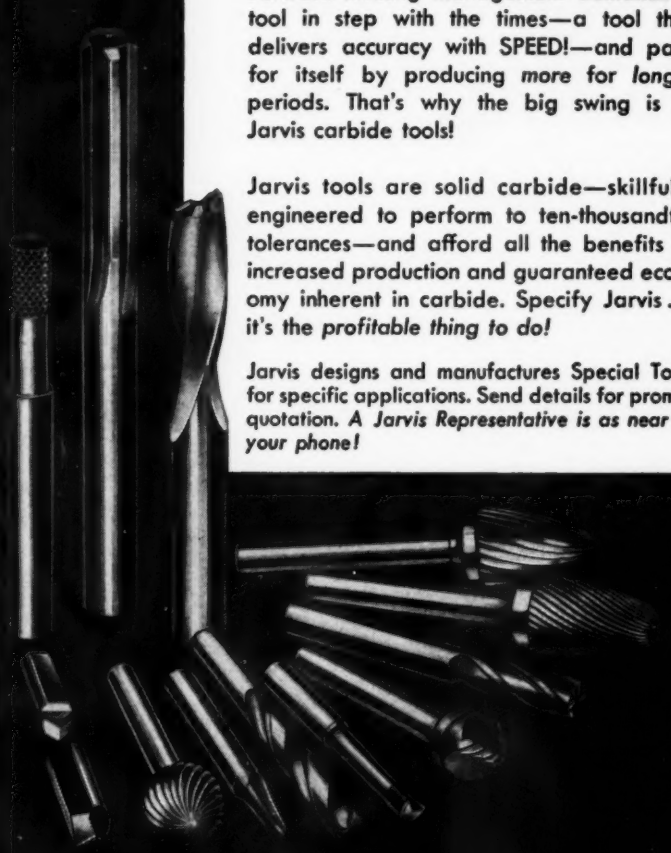
modern MACHINES demand
MODERN solid carbide TOOLING!

Jarvis SOLID CARBIDE GIVES MAXIMUM EFFICIENCY AND ECONOMY!

Forward-thinking management demands a tool in step with the times—a tool that delivers accuracy with SPEED!—and pays for itself by producing *more* for *longer* periods. That's why the big swing is to Jarvis carbide tools!

Jarvis tools are solid carbide—skillfully engineered to perform to ten-thousandths tolerances—and afford all the benefits of increased production and guaranteed economy inherent in carbide. Specify Jarvis... it's the *profitable thing to do!*

Jarvis designs and manufactures Special Tools for specific applications. Send details for prompt quotation. *A Jarvis Representative is as near as your phone!*



Send today for catalog describing hundreds of Jarvis production-increasing tools.

Jarvis CORPORATION
POWER TOOLS FOR INDUSTRY
MIDDLETOWN, CONNECTICUT

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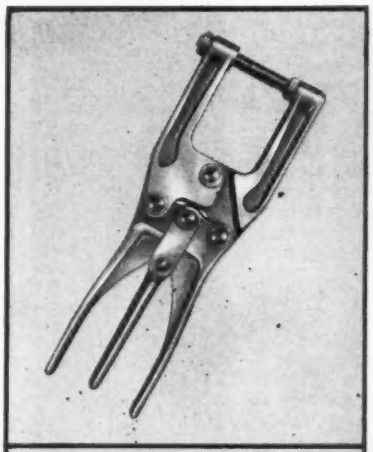
Only WESPO® can furnish ALL of the following WORK-HOLDING DEVICES

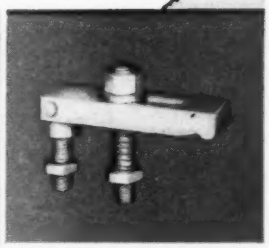
● ***TOGGLE CLAMPS and PLIERS***

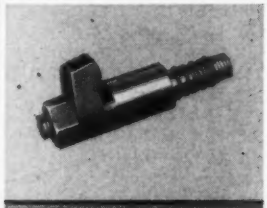
37 TYPES and SIZES

WESPO Toggle Clamps are made in types and sizes to meet all work-holding needs, light, medium and heavy duty. Features include: REAMED HOLES, for better bearing—HARDENED BUSHINGS—SERRATED to prevent turning—HIGH TENSILE STRENGTH RIVETS for longer service.

NEW—TOGGLE PLIERS with QUICK TRIGGER RELEASE, working in both directions.







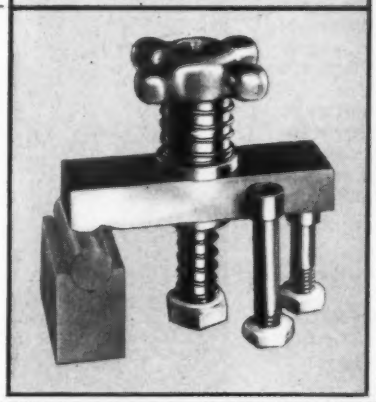
● ***FIXTURE CLAMPS***

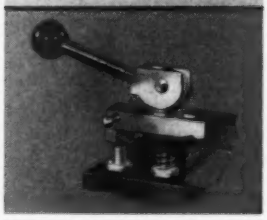
16 STYLES—159 SIZES

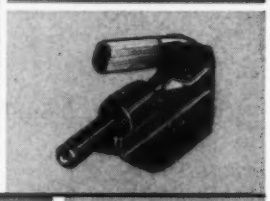
WESPO fixture clamp assemblies save up to 70 percent on your own designing and machining. They are being used as standard by a large number of leading manufacturers.

NEW—SWINGLOCK—faster, because operated by ONE HAND.

THERE IS A WESPO CLAMP TO SUIT EVERY JOB



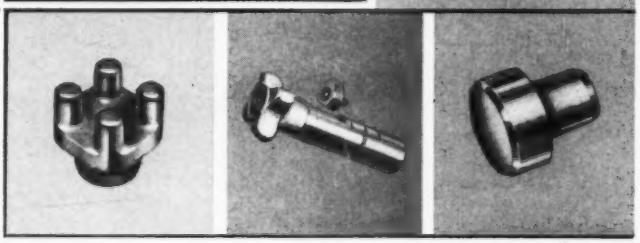




● ***COMPONENTS***

Over 1000 types and sizes available *from stock.*

WESPO parts are precision manufactured of quality steel—heat treated and rust proofed. They are designed for heavy duty and long wear and have proved their value in many industries.



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TEMPLATE SHEETS AVAILABLE.

WEST POINT MANUFACTURING CO.

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CIRCLE INFORM-A-GRAM KEY NO. 40

Bellows DRILL PRESS FEED

AIR-POWERED RAPID TRAVERSE
HYDRAULIC FEED RATE CONTROL
ELECTRICALLY OPERATED

- **Installs in less than half an hour**
- **Often doubles, even triples production**

A Bellows Drill Press Feed quickly turns any standard manually operated drill press into an automatic or semi-automatic drilling unit—with full precision control over every phase of its operation.

A touch on the operating control and the drill rapidly advances to the work, is fed through the work under smooth hydraulic control, and returns to starting position. Cycling can be single or continuous. It can be electrically interlocked with work feeding and work holding devices.

The Bellows Drill Press Feed can be installed in less than half an hour. It can be moved from one drill press to another. It doesn't interfere with hand operation of the drill press.

More than 10,000 companies use Bellows Drill Press Feeds. In some plants as many as 400 Feeds are in everyday use—drilling, tapping, reaming, counter boring, threading—building production records that are hard to believe unless you use Bellows Drill Press Feeds yourself.

WRITE TODAY FOR Free BOOKLET

16 pages of facts on how you can use Bellows Drill Press Feeds to cut your drilling costs to a new low. Ask for Bulletin DF-110

Address: The Bellows Co., Dept. TP956 Akron 9, Ohio.

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Controlled Air-Power

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The Bellows Co.

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FOR FASTER, SAFER, BETTER, AND LOWER COST PRODUCTION

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HARDINGE
ELMIRA, N.Y.

HARDINGE Sjogren Chucks

Quality at Low Cost

HARDINGE-SJOGREN Speed Collet Chucks for tool room lathes, engine lathes and grinders.

Available in Five sizes to suit your work requirements: 1 1/16", 1 3/8", 1 3/4", 2 1/4" and 3 1/2" Capacity

1 3/8" Capacity
Plain Back
$91.00

1 3/8" Capacity
D1-6" Cam Lock
$103.00

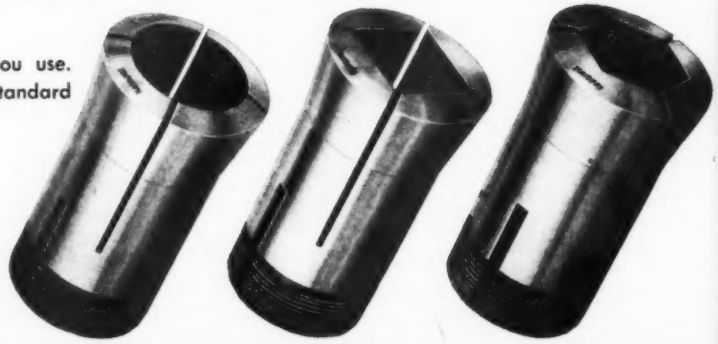
1 3/8" Capacity
No. 1 Taper Key
$107.00

HARDINGE
ELMIRA, N.Y.

HARDINGE Low Cost Steel Collets

Maximum efficiency — Pay for only what you use. Records show that 82% of all sizes used are standard 16th sizes.

Buy only the sizes you use — Hardinge Collet stocks are available in Hartford, New York, Philadelphia, Baltimore, Rochester, Dayton, Detroit, Chicago, St. Louis, Minneapolis and Los Angeles. Also, Toronto and Montreal, Canada.



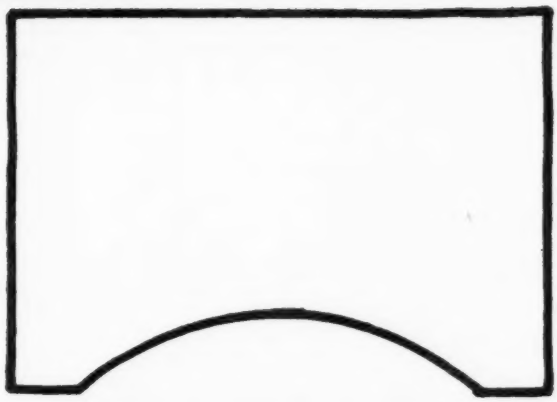
HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 42

DROODLES

by ROGER PRICE

J&L



Bench Model BC-7D

Floor Model FC-30

Floor Model FC-14

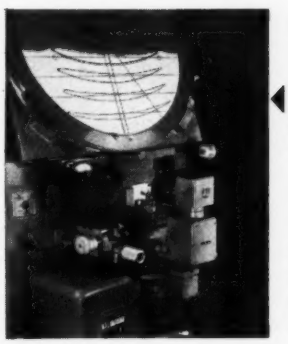
Table Model TC-14
(Vertical Inspection)

"DRAWING BOARD FOR FAT DRAFTSMAN"

The "Comfy-Contour" drawing board was invented by my uncle Claude, an obese but brilliant man. He once had a fat commission to design new camel troughs for the Turkish government, and was rewarded with the honorary title of Emir Bey Windeau. Claude was very good-natured, and never beefed when we kids used his cummerbund for a pup tent. But, like all us talented people, he was sensitive, too. Like the time he thought his boss called him "clod". Claude up and belly-bunted him right over the office Coke machine. It wasn't a wise thing to do, but you had to admire his guts.

Another big development that wins admiration is the ever-increasing use of Jones & Lamson Optical Comparators. These precision-built instruments are being used throughout industry for measuring and inspecting all sorts of parts and objects. The J & L Comparator is accurate to .0001", and its versatility makes it equally suitable for both production-line and job-shop work. With a Jones & Lamson Comparator in your shop, you'll find you can perform inspections that just can't be done by other methods. Available in eleven bench and pedestal models. For complete information, write Dept. 710 *today*.

JONES & LAMSON OPTICAL COMPARATORS *On the Job...*



Checking gages to close tolerances at Winslow Mfg. Co., Cleveland, Ohio

Templates used for manufacturing process are checked to tolerances of .0002". Standard Guillotine gages are duplicated from these "masters", for use by leading jet-engine makers in checking airfoils.

Multiple inspections at a glance at Zagora Gears, Inc., Charlotte, N. C.

Large capacity and ease of operation allow the inspection of oil grooves, shoulder lengths, several diameters; lead, pitch diameter and thread angle of thread and worm on these precision gear shafts *in one simple operation.*

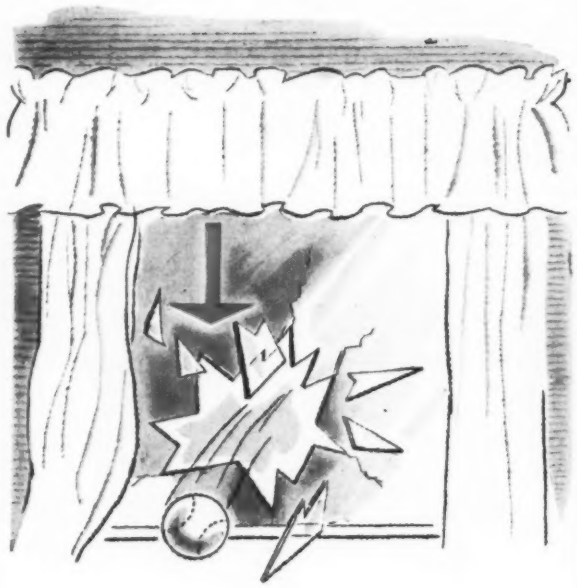
JONES & LAMSON

World's Largest Manufacturer of Optical Comparators since 1919

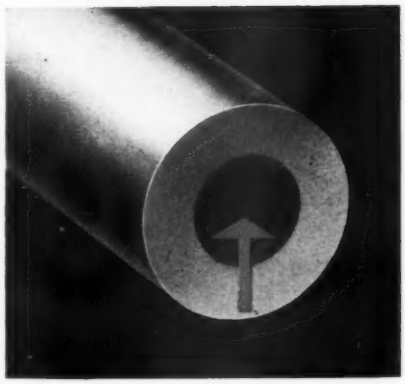
JONES & LAMSON MACHINE COMPANY, 519 Clinton St., Springfield, Vt., U.S.A.

OPTICAL COMPARATOR DIV.

CIRCLE INFORM-A-GRAM KEY NO. 43



a hole here means work...



a hole here saves work

Crucible Hollow Tool Steel Bars take much of the work out of making ring-shaped steel parts, or tools with a center hole. The hole's already there. You save expensive drilling, boring, cutting-off and rough-facing operations . . . you reduce machine time and scrap losses.

You can now get Crucible Hollow Tool Steel Bars in any of the famous Crucible tool steel grades, in virtually any I.D. and O.D. combination. And you can get *immediate delivery* from stock of the five most useful grades — KETOS oil-hardening . . . SANDERSON water-hardening . . . AIRDI 150 high-carbon, high-chromium . . . AIRKOOL air-hardening . . . NU DIE V hot-work tool steels.

Your Crucible representative can quickly show you how Crucible Hollow Tool Steel Bars will save you work and money. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

CIRCLE INFORM-A-GRAM KEY NO. 44

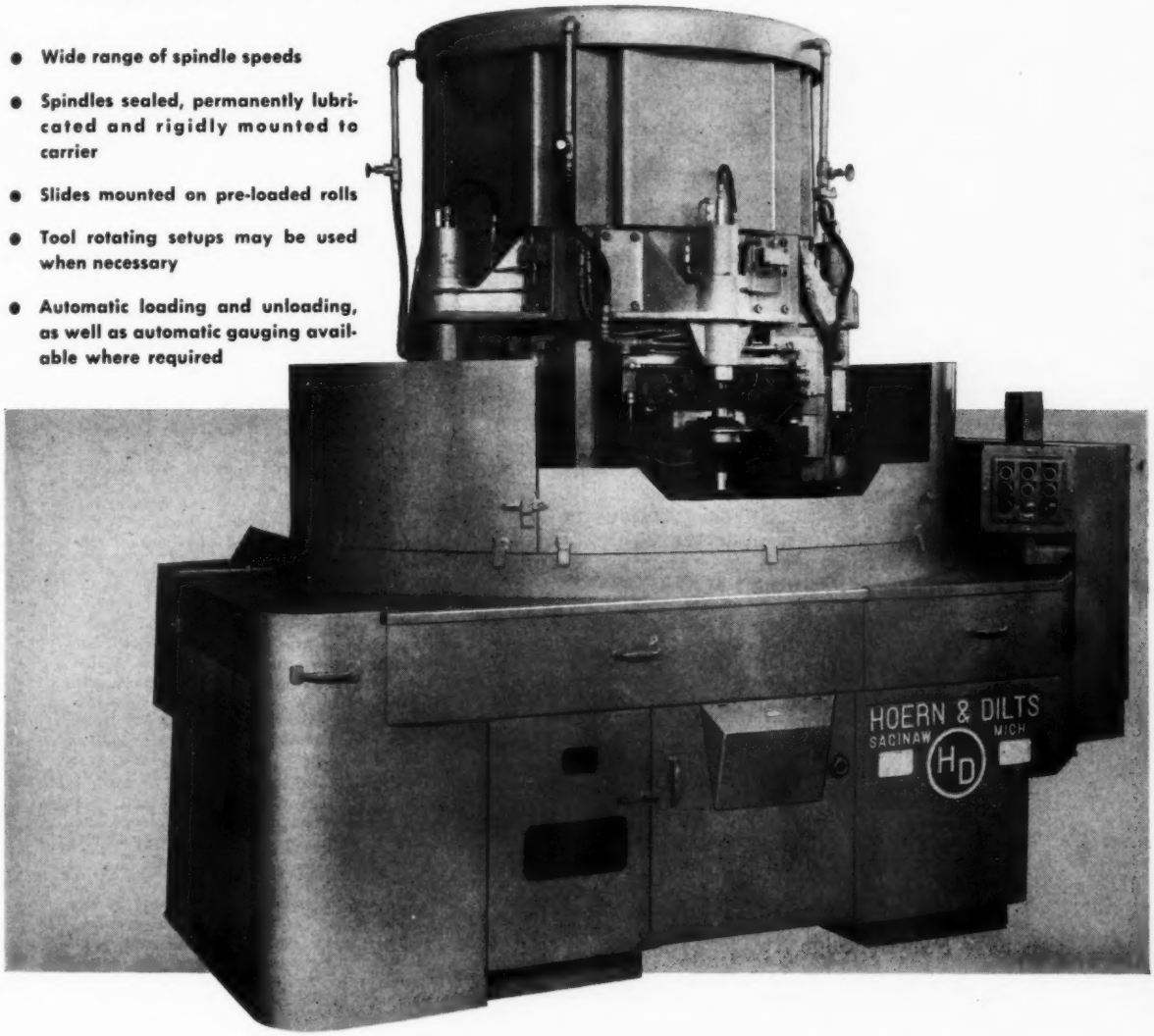
for your precision boring . . . .

5 times as many pieces every hour

Hoern & Dilts continuous boring machines have *five* sets of contour turning and boring slides, each serving one or two spindles and continuously moving around a central column. Slides and spindles travel together. Operator merely loads and unloads.

Pieces are completely turned, bored and faced in one circuit around the machine. One set of stationary cams actuating all slides provides absolute duplication of dimensions between stations.

- **Wide range of spindle speeds**
- **Spindles sealed, permanently lubricated and rigidly mounted to carrier**
- **Slides mounted on pre-loaded rolls**
- **Tool rotating setups may be used when necessary**
- **Automatic loading and unloading, as well as automatic gauging available where required**



Hoern & Dilts engineers will welcome the opportunity to cooperate with you on any high production finishing operation.

HOERN & DILTS DIVISION

The New Britain Machine Company • Saginaw, Michigan

OTHER NEW BRITAIN MACHINE TOOL DIVISIONS

New Britain-Gridley Machine Division
New Britain, Connecticut
Automatic Bar and Chucking Machines
Precision Boring Machines and New Britain +GF+ Copy Turning Lathes

Lucas Machine Division
Cleveland, Ohio
Precision Horizontal Boring, Drilling and Milling Machines

CIRCLE INFORM-A-GRAM KEY NO. 45

MANUFACTURING MEMOS

Mergers . . .

● Diamond Screw Products and Detroit Nut Co. have merged. The new organization, known as Detroit-Diamond Screw Products Co., will be directed by David S. Diamond.

● Swift-Ohio Corp. has been formed with the merger of Swift Electric Welder Co. and Ohio Machine Tool Co. The executive and sales offices are in Detroit and the plant in Kenton, Ohio. The new corporation will offer a variety of combined welding, machining and assembly equipment to meet new automation requirements of industry.

● Birdsboro Steel Foundry and Machine Co. has taken another step in diversification in a merger with Universal Major Elec. Appliances, Inc. The merged firm will continue manufacturing hydraulic presses, steel mill rolling equipment, rolls, jaw crushers and steel castings.

Receives Award . . .

● Henning W. Prentis, Jr. has been selected to receive the 1956 Henry Laurence Gantt Gold Medal, the highest award in the management field. He was cited for his contribution to the field of management, participation in the community activities, example to others in accepting the responsibilities of citizenship and understanding of human relations. He is chairman of the board of Armstrong Cork Co.

Shaped Diamond Tool Course . . .

● The nation's first laboratory for instruction in shaped diamond tool technology has been established at Illinois Institute of Technology, Chicago, under a $30,000 grant from Industrial Distributors, Ltd., Johannesburg, South Africa. The course, designed to instruct industry in the construction and use of shaped diamond tools, will be offered evenings beginning in the fall.

● Entries are now being received by Pressed Metal Institute for the 1957 John Woodman Higgins — PMI Redesign Award. The subject for the redesign can date back as far as eight years. Entries are judged on the basis of originality, ingenuity, cost savings, performance advantage and general applicability.

● PMI's annual Presteel Award nominations are being considered. Criteria for judging include notable advances in developing and marketing products using stampings, public education activities, company growth trends and participation in formal education.

Allegheny Ludlum Steel Corp. has purchased Paul R. Repath, Inc., of Los Angeles. The company is a leading West Coast producer of electrical steel laminations, metal stampings and deep drawn transformer cans. The plant will be operated as Repath Pacific Division of The Arnold Engineering Co., an Allegheny Ludlum subsidiary. Paul R. Repath will continue to direct the activities of the Los Angeles facility.

◆

The U. S. commercial magnesium production total will be increased 15% when a new $7,000,000 plant in Selma, Ala., goes into operation in 1957. The plant will have a rated annual production capacity for high purity magnesium of 10,000 tons. Brooks and Perkins, Inc. and Dominion Magnesium, Ltd. of Toronto, will be in joint ownership of the new corporation known as the Alabama Metallurgical Corp.

◆

The formation of the Hupp Aviation Division of Hupp Corp. has been disclosed. The new division will enable the company to consolidate its aviation engineering, development and sales activities on a company-wide basis. T. V. Purvin has been named president of the new division.

◆

The machine tool and pedestal grinder product lines of Bradford Machine Tool Co. have been acquired by Frank B. Stallings of Cleveland. A new company has been formed — The Bradford Machine Tool Co. of Michigan — which has been moved to Lansing, Mich. from Cincinnati, Ohio.

◆

Supreme Products, Inc. of Chicago has been acquired by American Safety Razor Corp.

◆

The name of Austenal Laboratories, Inc. has been changed to Austenal, Inc. to reflect the wider range of the company's activities. Austenal is a leading company in the field of investment casting.

◆

Brown & Sharpe Mfg. Co. and Nelco Tool Co., Inc. have combined sales operations. Through Brown & Sharpe-Nelco distributors, "on the spot" delivery of more than 3000 standard carbide, carbide tipped and high speed steel metal cutting tools and accessories is assured.

"Commendable Comments"

"The cheapest thing to do is to build versatility into a machine when you buy it . . . never keep what you ultimately want a big secret from the man who is going to sell it to you. Bring your supplier in on your problem."

—Melvin D. Verson, assistant sales manager, Verson Allsteel Press Co., at the Institute of Appliance Manufacturers' Convention.

"The national productivity improvement factor depends on a great variety of influences, but a major one is the level of technical education which the nation is able to reach through its educational system."

—John J. Cronin, vice president in charge of Manufacturing Staff, General Motors Corporation, at its Annual Conference for Engineering Educators.

"Automation is the substitution of mechanical, pneumatic, hydraulic, electric, and electronic devices for human organs of decision and effort."

—Milton H. Aronson, Editor of Instruments & Automation magazine, quoted in "The Automatic Factory — A Critical Examination."

"In industry, isotopes now benefit the country by saving an estimated $250-million per year in industrial processing costs."

—Remarks by Dr. Willard F. Libby, Commissioner of the Atomic Energy Commission, at Reed College, Portland, Ore.

"During the war, collaboration between scientists and engineers on atomic energy, guided missiles, rockets, fire control systems and radar was handicapped because scientists and engineers spoke such different languages. One of the greatest difficulties was that scientists and engineers insisted on using different units of measurement. Mathematics bridged the gap and has become the common language, and the first requirement of the engineer-scientist is that he be proficient in using mathematics as a real tool."

—Dr. Earl P. Stevenson, chairman of the board of Arthur D. Little, Inc., speaking at the annual meeting of the American Society for Engineering Education at Iowa State College.

"The first battle you and I, as American citizens, as industrialists, and as educators, have to win is the battle with ourselves against plain, ordinary apathy — apathy toward seemingly little local problems which, untended by us and our counterparts in thousands of communities over the land, become mighty national issues."

—Cola G. Parker, president of the National Association of Manufacturers in an address at Syracuse University.

REAMERS
TAPS
KNURLS
THREAD ROLLING DIES
CUT-OFF BLADES
Screw Machine Cutting Tools
for the long run . . .
because they run longer!
MONOCONE DIES AND HOLDERS
DUOCONE DIES AND HOLDERS
Next time you buy Screw Machine Cutting Tools, remember it's not the purchase price but what you get for your money that counts most . . . how many pieces each tool delivers on the production line!
In correct design and high quality, P&W Screw Machine Cutting Tools rate as the best buy anywhere. And you can select the tools you need — when you need them — from comprehensive warehouse stocks carried on the shelves at the Pratt & Whitney Branch Office conveniently near you.
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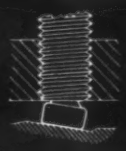
MACHINE TOOLS • GAGES • CUTTING TOOLS

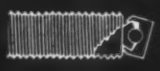
VLIER® SWIVEL-PAD® CLAMPS

Now Available in 2 Types!

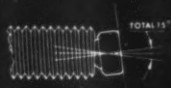
Both types have these outstanding features!



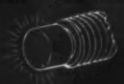
- Screw torque absorbed by pad—not the work piece.



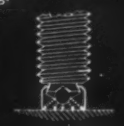
- Unique ball-joint construction provides extremely smooth angle adjustment and rotation of pad.



- Pad swivels 7½° each side of center line in all directions.



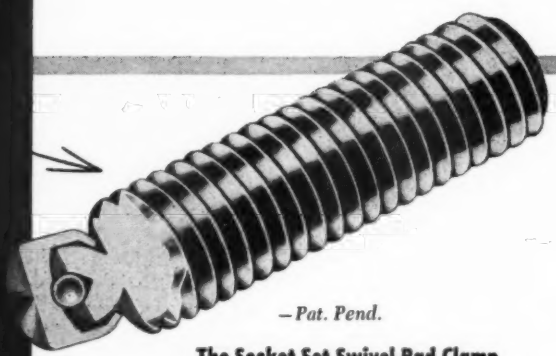
- Large flat pad area assures tighter clamping.



- Conical seat distributes clamping pressure uniformly.
- Eliminates costly, custom-made swivel pads.
- Du-Lite finish for rust proofing.
- Made from heat-treated, alloy steel to last for years.

—Pat. Pend.

The new Knurled Head Swivel-Pad Clamp
Use when finger-type clamping is sufficient. Wide knurled-head gives good gripping; assures fast screw run-in. Available in 4 different screw diameters; 1½" and 2" screw lengths.



—Pat. Pend.

The Socket Set Swivel-Pad Clamp
Use wherever maximum rigidity is necessary, or where space is limited. Available in 7 screw diameters; various lengths.

Write for free 1956 Vlier catalog.

Other Vlier products

Spring Plungers

Spring Stops

Toggle Pads

Fixture Keys

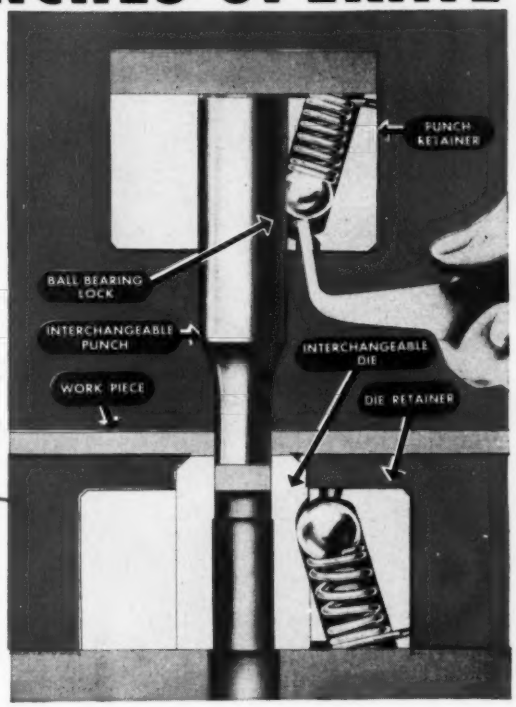
Torque Thumb Screws

VLIER ENGINEERING INCORPORATED
8900 Santa Monica Blvd., Los Angeles 46, California

Distributors located in major U.S. and Canadian industrial areas.

CIRCLE INFORM-A-GRAM KEY NO. 48

HOW R-B PUNCHES OPERATE



All R-B retainers are equipped with spring-loaded locking balls which engage the recessed portion of R-B punches and die buttons. With a simple push and a twist, R-B standardized punches and die buttons are locked in their retainers . . . they are also instantly removed. R-B punches and die buttons are always accurately aligned—no additional keying is required.

No other manufacturer of punches and die buttons can offer you the amount of successful application experience and the scope of knowledge that is available from the R-B engineering staff for:

- ★ Cutting Your Production Costs
- ★ Reducing Die Designing Time
- ★ Increasing Productivity of Presses
- ★ Supplying Answers to Piercing Problems
- ★ Saving Die Construction Time
- ★ Complete Standardization of Press Tooling

For Additional Information or Engineering Service, Write to:

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 84 . 26476 CAPITOL AVENUE . DETROIT 39, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 49

Why the trend to heat-treated cap screws in the heavy equipment industry?

Chicago Screw engineers worked with leading manufacturers to develop the high-strength, heat-treated screws that take more punishment and greatly reduce fastener costs

Strength, and the ability to withstand severe punishment, are prime requirements for fasteners used in heavy equipment. As a leading fastener source for most of the top manufacturers of heavy equipment, CHICAGO SCREW conducts a thorough research and development program aimed at steadily improving fastener performance.

A major result of this program is the development of the CHICAGO *carbon-restored* heat-treated cap screw, now replacing bright-finish fasteners for most heavy equipment applications. Design engineers have found the far greater tensile strength of the heat-treated fastener (see chart) gives a better fastening with fewer—or smaller—screws. This means less weight . . . and a considerable reduction in fastener costs.

In addition to greater strength, CHICAGO heat-treated cap screws prove far superior in withstanding fatigue, wear, shock and vibration. This is because a major cause of fastener failure—a surface layer of soft, decarburized steel—is eliminated by our unique Carbon Restoration process. Vital surface carbon is restored in a scientifically controlled process during final heat-treating, producing a fastener that's uniformly hard from core to surface.

Our engineers will be glad to advise you on designing to best take advantage of heat-treated cap screws. For complete information on cost savings you can get in your products . . . and a detailed version of the condensed tensile strength chart at right . . . drop a line to our Standard Products Division.

HOW TENSILE STRENGTH COMPARES

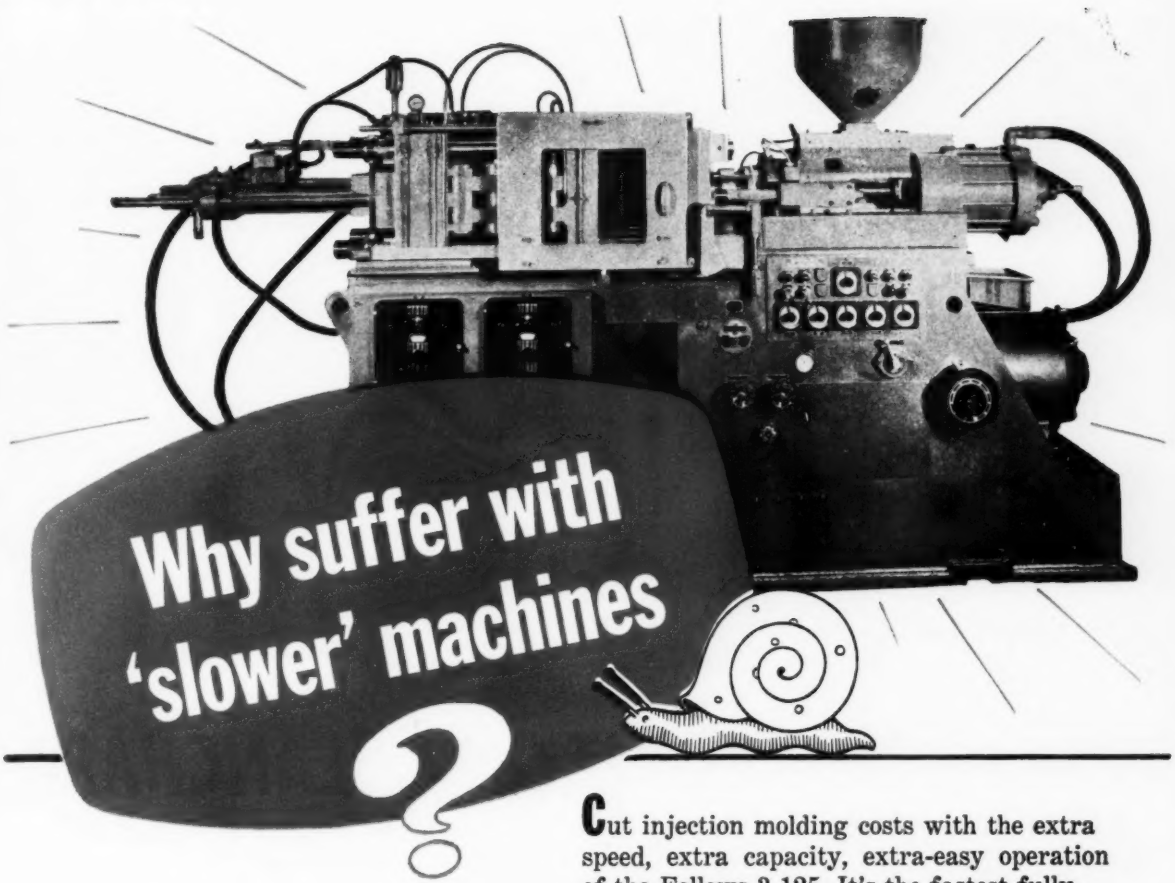
Diameter (Coarse Thread)	Bright Cap Screws Tensile Strength (Pounds)	Heat-Treated Cap Screws SAE Grade 5 Tensile Strength (Pounds)
¼	2,150	3,810
5/16	3,550	6,270
⅜	5,250	9,280
7/16	7,200	12,720
½	9,650	17,000
9/16	12,400	21,800
⅝	15,400	27,070
¾	21,400	40,100
⅞	29,500	53,040
1	38,700	69,590

THE CHICAGO SCREW COMPANY

DIVISION OF STANDARD SCREW COMPANY • ESTABLISHED 1872

2519 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 50



Increase profits per piece with FELLOWS 3-125

Cut injection molding costs with the extra speed, extra capacity, extra-easy operation of the Fellows 3-125. It's the fastest fully-automatic 3-ounce machine you can buy!

The "3-125" has dry-run speeds from 600 to 840 cycles per hour, gives you shots up to 4.5 ounces with the optional "pre-pack" device. Set-ups and change overs are simple. Controls are built-in and grouped for easy setting, easy checking. Fully automatic operation means one man can operate three or more machines with ease.

And the Fellows 3-125 has many other exclusive features that help cut your production costs. Ask your Fellows Representative for full information about the complete line of Fellows Injection Molding Machines. And ask him about the Fellows Plan for deferred payment.

Fellows

injection molding equipment

THE FELLOWS GEAR SHAPER COMPANY, Plastics Machine Division, Head Office and Export Department: Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2 • 150 West Pleasant Avenue, Maywood, N. J. • 5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

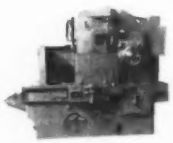
CIRCLE INFORM-A-GRAM KEY NO. 51

W-1143

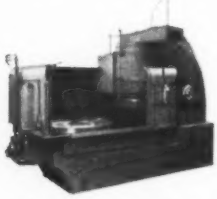
tiny or **tremendous...**

W-1145

For best results...*PUT IT ON A BLANCHARD!*



Blanchard No. 18



Blanchard No. 42-84

There's a Blanchard for every surface grinding job, in a broad range of sizes. For example, the Blanchard No. 18 grinds non-magnetic transistor elements (upper left) .006" thick, to a tolerance of .0005" with good finish. This job, which involved .006" to .008" stock removal per side, was held on special fixture plates.

At the other end of the scale, a huge Blanchard No. 42-84 Grinder grinds a turbine housing (upper right) which measures 83" across the corners, and is 28" high. This housing, ground after rough machining, required .020" stock removal. Both this piece and its mating part were ground to a steam-tight joint.

Whatever *you're* grinding—be it tiny watch parts, giant steel plates, or anything in between—there's a Blanchard designed to do the job speedily and accurately.

Ask for details on the 15 standard Blanchard models.

PUT IT ON THE BLANCHARD

Send for free copies of "Work done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 52

MOTCH & MERRYWEATHER CUT-OFF BLADES and SLITTING-SLOTTING SAWS

Triple-Chip

From a very small slitting saw to a very large cut-off blade, Motch & Merryweather makes them all.

STOCKING DEALERS in all principal cities.

FACTORY-APPROVED SERVICE in many industrial centers.

ENGINEERING SERVICE to solve your specific problem.

Challenge Motch & Merryweather to demonstrate that the Triple-Chip Method will cut off stock in faster time, with greater precision, and at lower cost than any other method. Rely upon Motch & Merryweather to engineer your job, recommend the right blade, and follow through. Our wide range of blades and saws is coupled with a wealth of technical experience and data on every phase of the circular sawing of all metals. Motch & Merryweather sales engineers in conjunction with dealers nation-wide stand ready to analyze your exact requirements and recommend a complete, profitable solution. Ample, strategically located stocks insure satisfactory delivery.

Also Kroslok Face Milling Cutters and Shell End Mills. Also Triple C Grinding and Cutting Coolants and Machine Cleaner.

THE MOTCH & MERRYWEATHER MACHINERY CO.

Cutting Tool Manufacturing Division

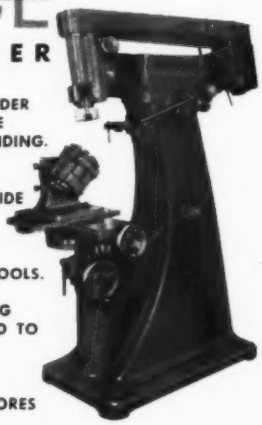
1250 EAST 222nd STREET, CLEVELAND 17, OHIO

TRIPLE-CHIP CIRCULAR SEGMENTAL AND SOLID CUT-OFF BLADES • TRIPLE-CHIP SLITTING SAWS • KROSLOK FACE MILLING CUTTERS AND END MILLS • TRIPLE C GRINDING COOLANT • TRIPLE C MACHINE CLEANER • TRIPLE C CUTTING COOLANT

CIRCLE INFORM-A-GRAM KEY NO. 53

Fewer Attachments...
Automatic Trueing...

THE
Oliver ACE
CUTTER GRINDER



- WITH THE OLIVER ACE CUTTER GRINDER TWO FIXTURES HANDLE A COMPLETE RANGE OF TOOL AND CUTTER GRINDING.
- STANDARD MODEL AVAILABLE FOR HIGH SPEED AND LIGHT DUTY CARBIDE GRINDING.
- HEAVY DUTY MODEL SUPPLIED FOR TUNGSTEN-CARBIDE CUTTERS AND TOOLS.
- AUTOMATIC TRUEING—THE GRINDING WHEEL FEEDS DOWN TO A DIAMOND TO MAINTAIN A FIXED GRINDING LINE.
- SHARPENS STRAIGHT OR TAPERED REAMERS, SPOT FACERS, COUNTERBORES AND END MILLS.
- SHARPENS STANDARD MILLING CUTTERS, STAGGERED-TOOTH CUTTERS AND DOUBLE ANGLE CUTTERS.
- GRINDS THE FACE, CORNER ANGLE, AND PERIPHERY ON FACE MILLS.
- FIXTURES AVAILABLE FOR POINT THINNING, RADIUS GRINDING, SMALL END MILL GRINDING AND BROACH GRINDING.

Keep Edges Sharp and Accurate on Cutters Like These . . . Write For Complete Information.

Oliver INSTRUMENT • COMPANY

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FACE MILL GRINDERS • AUTOMATIC DRILL GRINDERS • DIE MAKING MACHINES
TOOL & CUTTER GRINDERS • DRILL POINT THINNERS • TEMPLATE TOOL GRINDERS

CIRCLE INFORM-A-GRAM KEY NO. 54

Will You Be There?

Sept. 10-12. American Society of Mechanical Engineers. Fall Meeting. Denver, Colo.

•

Sept. 10-12. The Packaging Machinery Manufacturers' Institute. Packaging Machinery & Materials Exposition and Annual Forum. Public Auditorium, Cleveland, Ohio.

•

Sept. 10-14. New York University. Second Annual Titanium Lecture Program. NYU College of Engineering, New York.

•

Sept. 17-21. Instrument Society of America. Eleventh Annual Instrument-Automation Conference and Exhibit. New York Coliseum, New York.

•

Sept. 24-26. Industrial Truck Association. Fall Meeting. Greenbrier Hotel, White Sulphur Springs, W. Va.

•

Sept. 24-28. Atomic Industrial Forum, Inc. 1956 Trade Fair of the Atomic Industry. Navy Pier, Chicago, Ill.

•

Sept. 25-26. Atomic Industrial Forum, Inc. Forum on "Management and Technology for the Atomic Industry." Morrison Hotel, Chicago, Ill.

•

Sept. 25-28. Association of Iron and Steel Engineers. Iron and Steel Exhibition and Convention. Public Auditorium, Cleveland.

•

Sept. 30-Oct. 4. Pressed Metal Institute. Annual Convention. Pocono Manor, Pocono, Pa.

•

Oct. 1-3. American Institute of Electrical Engineers and others. National Electronics Conference. Hotel Sherman, Chicago, Ill.

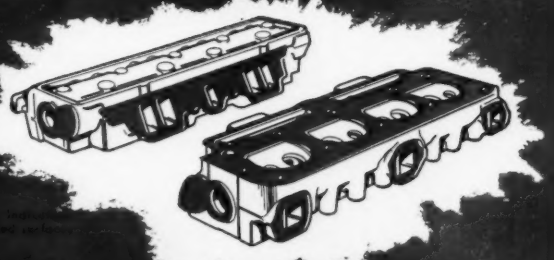
•

Oct. 8-12. American Society for Metals. Metal Show. Public Auditorium, Cleveland.

•

Oct. 10-11. The Material Handling Institute, Inc. Fall Meeting. The Traymore Hotel, Atlantic City, N. J.

CUSTOMER SPECIFIED



A leading automobile company requested Kearney & Trecker's Special Machinery Division to design and build an automatic transfer machine to perform a series of milling and drilling operations on V-8 cylinder heads.

KEARNEY & TRECKER MILWAUKEE® DESIGNED

Kearney & Trecker built this 12-Station Automatic Transfer machine which rough and finish mills the head gasket surfaces, mills intake and exhaust port surfaces and both ends, and drills, counterdrills and reams two holes on each of two cylinder heads for V-8 engines. Machine's production rate is 100 pieces per hour.

The two cylinder heads progress automatically through the machine side by side, each on separate transfer rails. Transferring, locating, clamping, lubrication and chip disposal are all automatic.

For more information on machine illustrated, ask for Data Sheet No. 1080. A new bulletin, SMD-56, which describes many of our outstanding designs, is also yours for the asking.

Production efficiency starts with Kearney & Trecker Milwaukee machine tools

This typical example reduced costs and meant higher production for the buyer. Kearney & Trecker's Special Machinery Division's 50 years' experience in machine design and manufacture can mean considerable savings to you.

Take advantage of our abilities. They can pay off in profits for you. See or write your Kearney & Trecker Special Machinery Division representative. He will be pleased to give you all the details on this production machine. Contact him today!

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Designers and Builders of Precision and Production Machine Tools Since 1898

CIRCLE INFORM-A-GRAM KEY NO. 55

"Customer Savings" is the Reason 1955 was the Best Year in Setko's 20-Year History

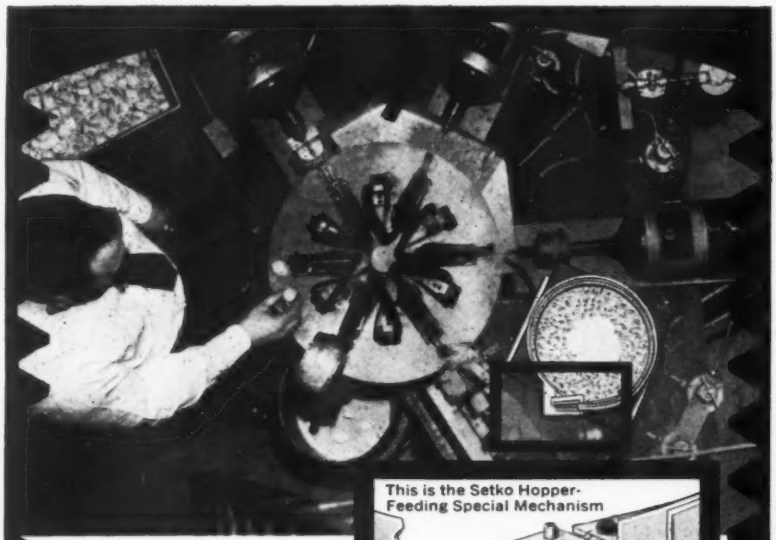
Set Screw News

Set Screw & Mfg. Co.

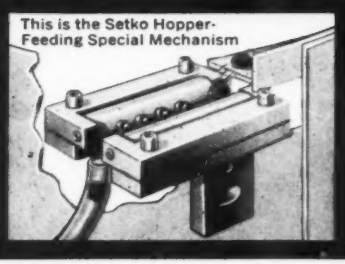
We specialize in Solving Puzzling Set Screw Problems

Issue No. 5 Bartlett, Illinois (Chicago Suburb)

Free Demonstration Shows How to Cut Costs with SETKO HOPPER-FED* Headless Set Screws



This is the Setko Hopper-Feeding Special Mechanism



How Rogan Bros. uses Setko Method of Hopper-Feeding Set Screws in its Automation of Drilling, Tapping and Inserting

Above is a typical Setko Hopper-Feeding Set Screw installation, showing its use with special equipment designed and used by Rogan Bros., Skokie, Ill., to drill and tap plastic knobs and insert set screws automatically in sequence. With this Setko method only one machine is required in place of three, and half the number of operators. This is one of many Setko Hopper-Feeding applications.

*Patent No. 2,638,945 Other Patents Pending

Available in Either of these Popular Styles with any Type Point

We Specialize in Solving Puzzling Set Screw Problems *by originating new developments such as these (Pat. Pending):*

Zip-Grip Self-Locking
Flush-Lok Self-Locking
Nu-Cup (increased holding power)
Fluted Self-Tapping
Self-Tapping Slotted Set and Fastening Screws
Point-Lok (for double screw application)
and many others
Check coupon for Bulletins

1429

Latest of Setko's many innovations is the new Hopper-Fed Set Screw, introducing an entirely new, exclusive method of application and offering—

Many Unusual Advantages

- Requires about one-tenth the time of former methods of headless set screw application as proven by actual test.
- Automatically inspects diameter and rejects misfits.
- Works equally well with all metals and with plastics.
- Takes less floor space and permits smaller set-screw inventory.
- Can be used for practically any headless set screw application, including the new Setko Self-Tapping.
- Reduces to minimum the problems of the "human" element, such as floor loss and cross-threading.
- Makes possible faster delivery.
- Can be obtained with any style point.

Operation

A step further toward ever-growing "automation"! The new, specially designed Setko Hopper-Fed Set Screws are mechanically fed from a vibrating hopper, down through a tube, and automatically positioned for driving. (See illustration at left.)

Mechanism and Demonstration

This special mechanism has been designed by Set Screw & Mfg. Co. exclusively for users of its new Hopper-Fed Headless Set Screws . . . and for its customers' protection, the mechanism and screws will be sold only to work in conjunction with each other. To show the many advantages of this new process, demonstrations of the hopper mechanism and screws are being made at the Set Screw & Mfg. Co. plant and arrangements will be made for anyone who wishes to come and see the demonstration.

Get Full Details

Learn *all* the time-and-money-saving advantages that the new Setko Hopper-Fed Headless Set Screws can bring you; find out how easy it is to have a demonstration. Don't bother to write a letter or even a postcard. Simply . . .

FILL OUT AND MAIL THIS COUPON

SET SCREW & MFG. CO., 158 Main St., Bartlett, Ill.

Without any cost or obligation on my part, please send me full particulars about the new Setko Hopper-Fed Headless Set Screws. (Check next line if you would like a demonstration.)

☐ I would like to have a demonstration of the special operating mechanism at your plant in Bartlett, Illinois (Chicago suburb). Please advise me how this can be arranged.

☐ Please send bulletins on..... ☐ Please send complete catalog .....

INDIV. NAME..... COMPANY.....

ADDRESS.....CITY.....ZONE...STATE.....

CIRCLE INFORM-A-GRAM KEY NO. 56

in **DRILL BUSHINGS!**

QUALITY
ACCURACY
LARGEST DELIVERABLE STOCKS ANYWHERE

Write today for the all-new 1956 catalog containing Technical Data, Comparison Tables, Price Lists and Name of Dealer in your area.

ACE DRILL BUSHING CO., INC.
5407 Fountain Ave., Los Angeles 29, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 57

MICROBORE

FLASH/CHANGE® the ultimate in QUICK CHANGE TOOLING

For General Purpose Work and Production Applications . . .

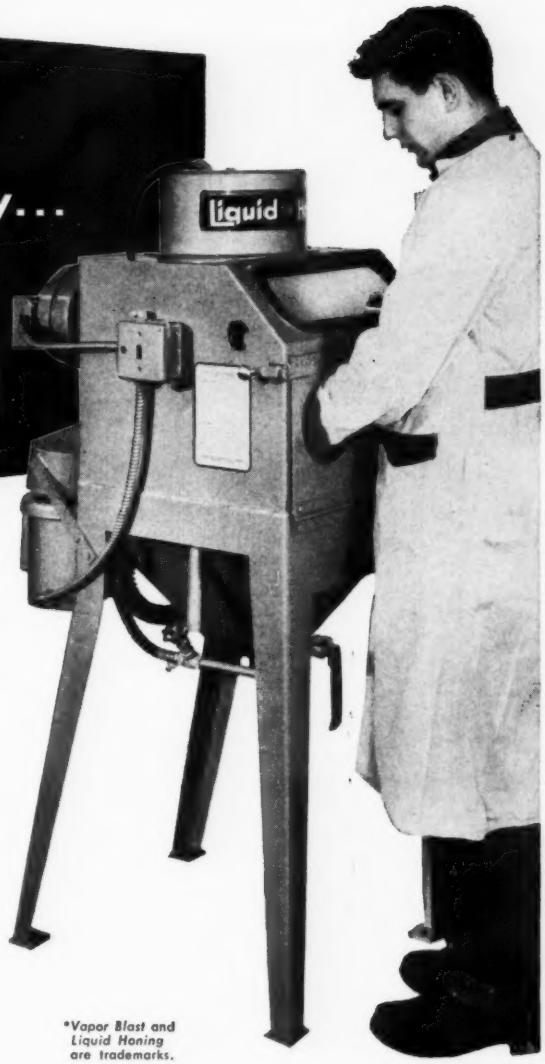
- A comprehensive range of Standard Microbore Flash-Change boring and milling equipment is available for tool work and general purpose machining.
- A complete service is available for engineering and manufacturing special Microbore Flash-Change equipment for all types of production operations.

Write for illustrated Flash-Change Catalog

DEVLIEG MICROBORE® DIVISION OF DEVLIEG MACHINE COMPANY

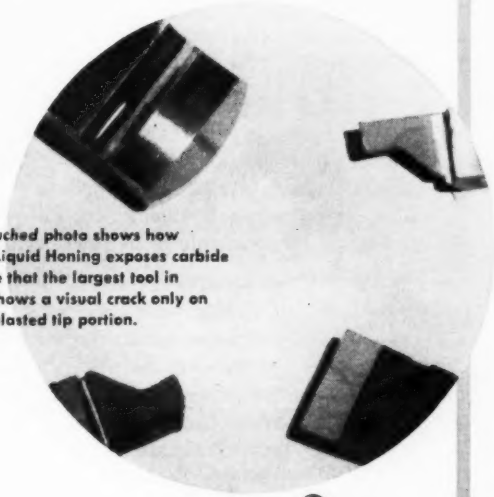
CIRCLE INFORM-A-GRAM KEY NO. 58

Detect Carbide Cracks Quickly, Positively... with V-B Liquid Honing*



Now you can prevent profit losses traceable to new or reground carbide tools that break because of cracks, porosity and other imperfections. Liquid-abrasive action flushes out the fine sintered material which, under grinding heat and pressure, often seals minute cracks and prevents detection by other methods. After Liquid Honing, fissures and other defects become *visually apparent* in a satin matte finish that remains dimensionally the same as the previous finish. Liquid Honing inspection processing is fast and thorough — more than 100 single-point tools per hour. And those tools, if not defective, last longer and cut better because they're free of burrs.

*Vapor Blast and Liquid Honing are trademarks.



This *unretouched* photo shows how effectively Liquid Honing exposes carbide cracks. Note that the largest tool in the group shows a visual crack only on the Vapor Blasted tip portion.

A Liquid Honing machine for carbide crack detection serves you in many other ways. Use it for surface conditioning, finishing, cleaning or descaling — often at production savings of 65% to 80%!

Write for complete information on case histories and low cost — only $550 to $1500 for a standard machine. And send a sample tool or part for free demonstration processing.

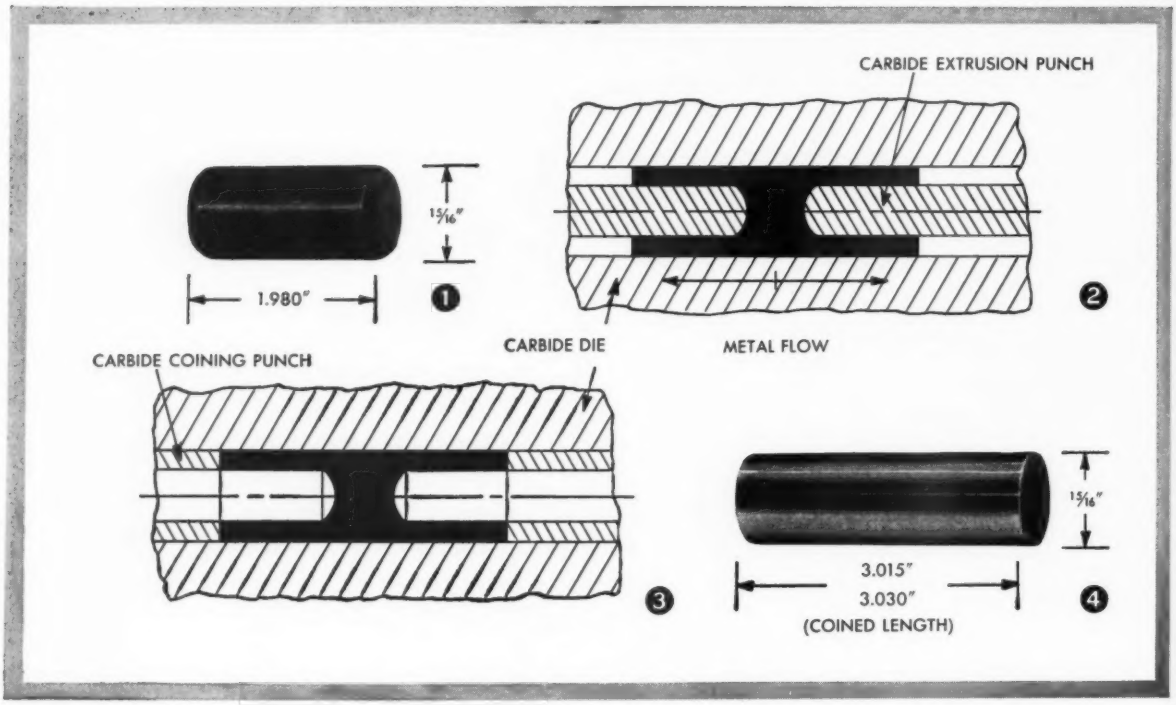
VAPOR V-B BLAST
MILWAUKEE WISCONSIN

VAPOR BLAST MFG. CO.
3131 W. Atkinson Ave. • Milwaukee 16, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 59

Increased output, material savings, and improved strength are accomplished . . .

Ford Motor Company cold-extrudes steel wrist pins with Carboloy dies



Solid steel slug (1) is cold extruded by opposed carbide punches (2) into correct shape. Carbide coining punches (3) size the pin to correct length, holding 0.015" tolerances. Finished pin (4) has the same volume of metal as the original slug. Only metal loss is in finish-grinding operation.

Almost 2000 two-inch steel slugs are cold extruded into three-inch wrist pins every hour at Ford Motor Company's new Cleveland engine plant.

The eight-station die holding the work, and the punches that extrude and coin the pin, are made of Carboloy* cemented carbide. By cold extruding with carbide dies, Ford has gained these important cost and product advantages: stronger, better parts, made from a low carbon, low alloy steel, with no scrap loss from machining . . . produced far faster than possible by machining.

Cold extrusion with carbide dies and punches can bring these and other benefits to many metalworking companies. Carbide engineers, with years of experience on cold-extrusion problems, are available to help work out specific applications.

To find out if cold extrusion with Carboloy cemented carbide dies is feasible for your application, check with your diemaker, or send your specifications to: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Blvd., Detroit 32, Michigan.*

CARBOLOY®

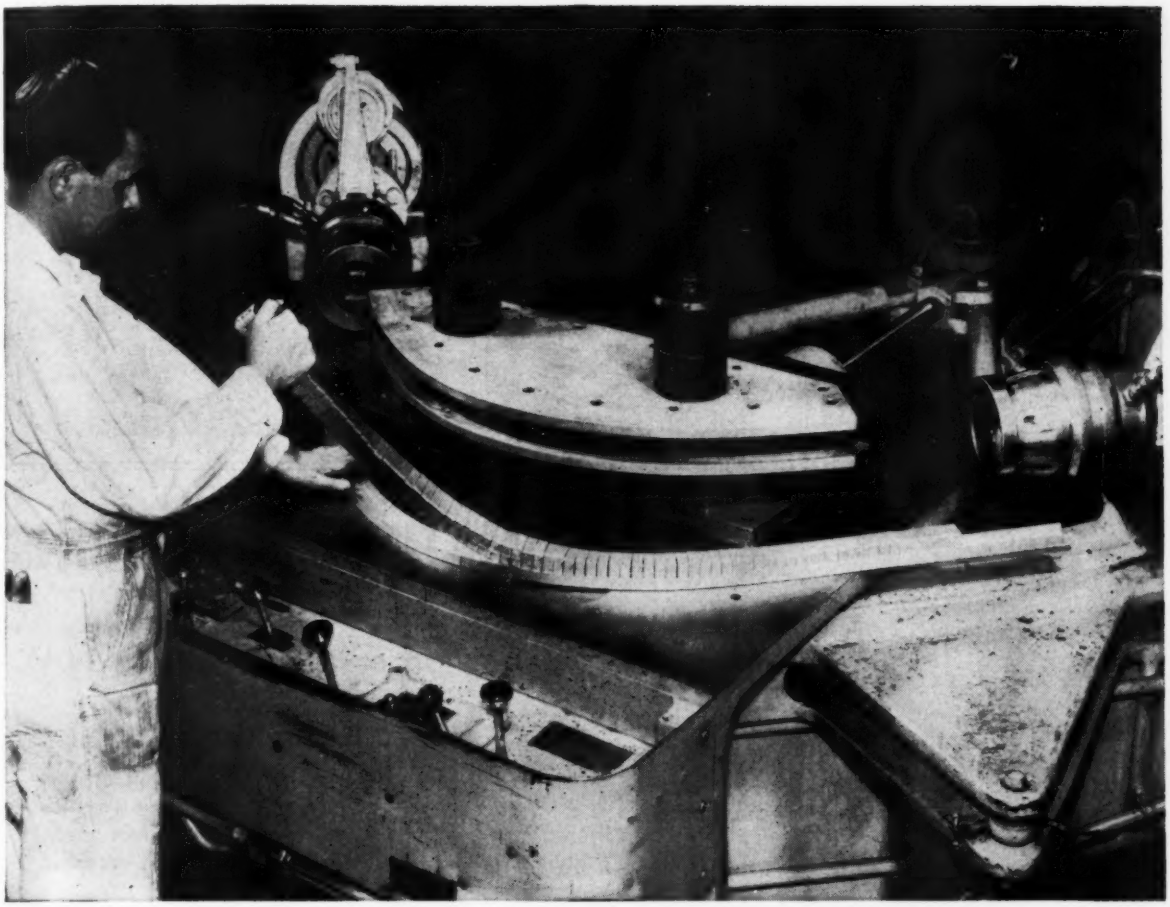
CEMENTED CARBIDES

*"CARBOLOY" IS A TRADEMARK OF GENERAL ELECTRIC COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 60

Made with MAGNESIUM for better stretch-forming.

DOW



TO THE RESCUE! Magnesium snake and tooling plate stretch-forming die has eliminated a lot of headaches for Hufford Machine Works, Redondo Beach, California. Galling, which causes scratching and excessive wear in stretch-forming aluminum extrusions, is no longer a problem since the company switched to magnesium dies. Something else, too—tool costs were cut 20%!

NO GALLING PROBLEM HERE!

Magnesium tooling plate solves this problem in stretch-forming aluminum

Latest development in stretch-forming — magnesium tooling plate. The number one reason is that magnesium's fine-grain, porosity-free structure and better slippage reduce galling to practically *nothing*.

Hufford Machine Works recently substituted dies made of magnesium tooling plate for the steel and aluminum ones they had been previously using. The result: the magnesium dies ran 500 pieces without showing wear and the aluminum extrusions showed no scratch marks!

There are other advantages to magnesium tooling plate. Light weight—one-fourth that of steel, one-third less than aluminum—makes magnesium dies much easier to handle and use. Excellent rigidity, strength and dimensional stability are also magnesium characteristics . . . as well as outstanding machinability and weldability.

Ready availability and lower prices complete the magnesium tooling plate picture. It's a picture you should look into to solve your own tooling problems! For more information about magnesium tooling plate contact your nearest supplier of Dow magnesium, or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 369AA.

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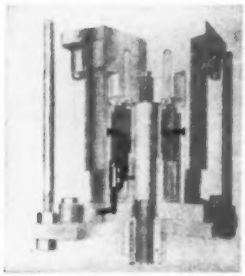
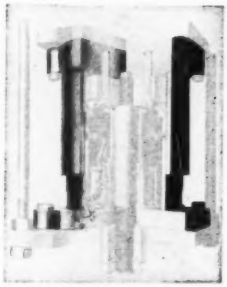
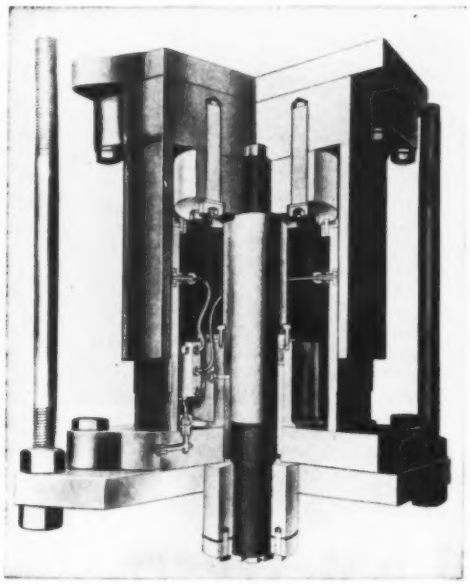


1. Centralized high pressure lubrication distributed to all points of wear through one conveniently located fitting.

2. Stainless steel extra large piston rod absolutely protects against corrosion and offers high strength stopping means.



3. All wrought steel welded and normalized construction gives maximum strength and protection.



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DAYTON ROGERS
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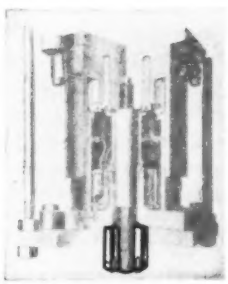
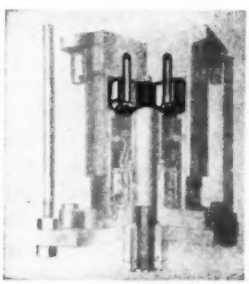
MINNEAPOLIS 7B, MINNESOTA

4. Bronze overlay on piston bearing surface.



5. Infinite height adjustment with "Thread-Loc" adjustment nut.



6. Piston rod secured through extra heavy flange for maximum protection to off-center loading.

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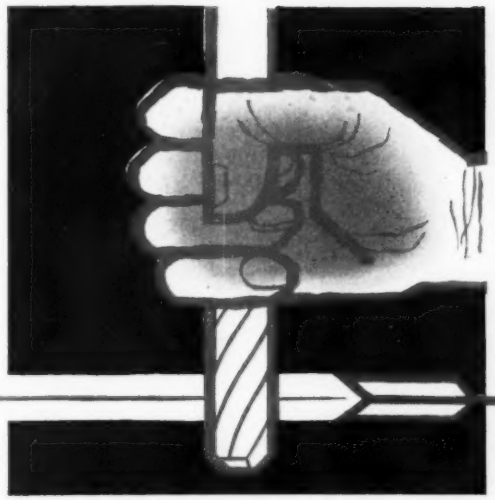

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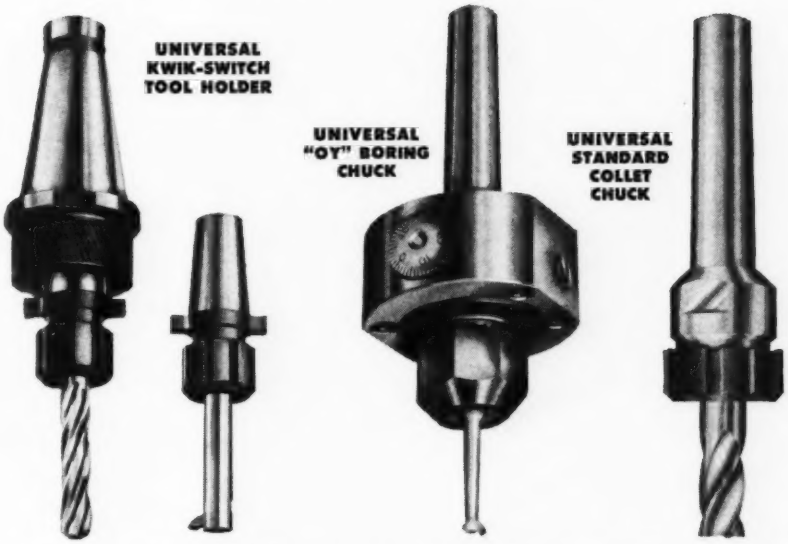

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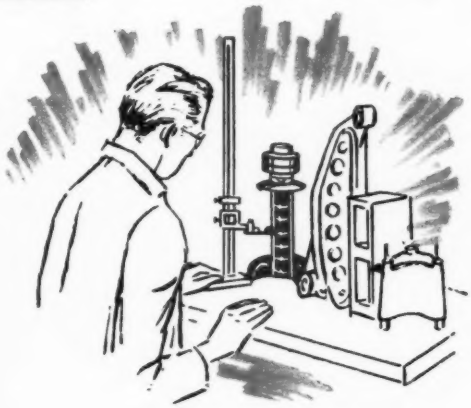

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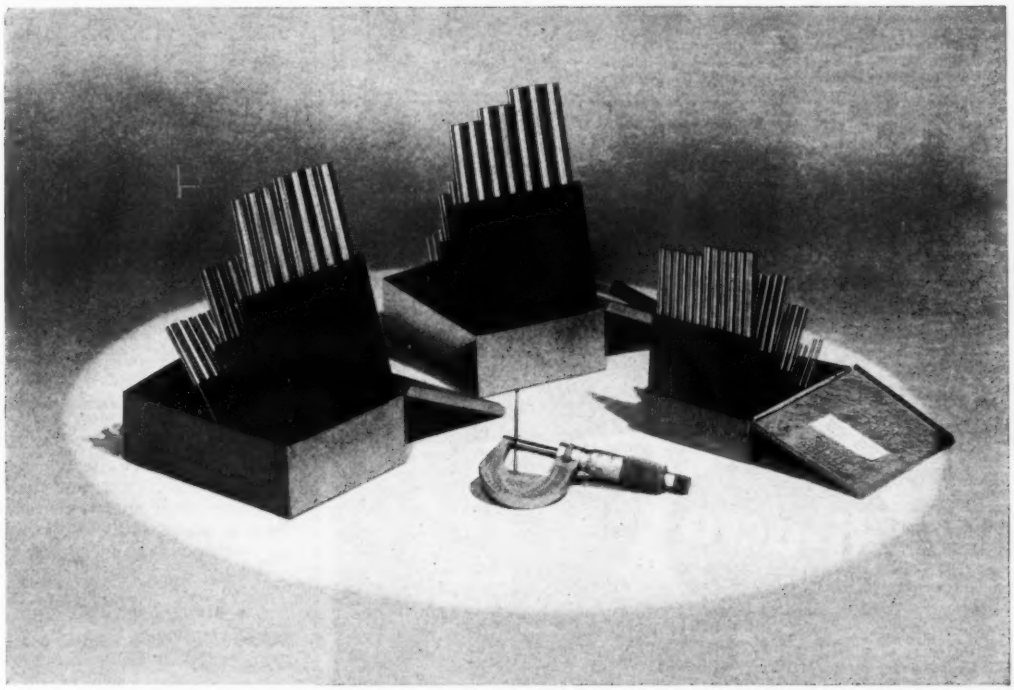

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CIRCLE INFORM-A-GRAM KEY NO. 67

Editorial Index

DEPARTMENTS

SHOP AIDS 112
Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

PUBLICATION PREVIEWS 130
Capsule description of current literature. Bulletins, brochures, catalogues and circulars — You name it.

PROGRESS ON PARADE 174
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EDITORIAL: Mathematics in Engineering 71

— FEATURES —

COMPUTER: "The Power of the Computer" by George J. Huebner, Jr., Chrysler Corporation 12

Solving complicated mathematical equations, developed in engine part design, was found next to impossible at Chrysler until access to a computer was effected. Mr. Huebner gives his experiences with the computer in speedily and accurately solving these equations.

CARBIDE MILLING: "Some Questions and Answers on — Milling with Carbides" 72

A panel of experts answer some machining and tooling operational questions in the use of carbides on milling machines.

ARBORS: "Arbor Helps Boost Gear Production" 75

A case history, showing how difficulties encountered in machining splined bore gear blanks are eliminated by use of Pin-Type Arbors.

AUTOMATION ASSEMBLY: "Mechanized Assembly Line Speeds Lock Production" by R. D. Enner, Standard Products Co. 76

Employing 13 hydraulic presses arranged for automatic transfer of workpieces, 10,000 auto locks, comprising 26 components, are assembled per shift.

BELT FEED: "Special Fixturing Permits High Volume Belt Grinding" .. 80

Special fixtures and a belt feed facilitate the grinding of flat and parallel surfaces on magnet cases in a single five second pass.

Editorial Index

TOOL SHARPENING CONTROL: "Hob Life Increased 5:1 — Control Program Ups Performance of Precision Tools" 81

The useful life of cutting tools can be increased by substituting scientific sharpening procedures for guess work. This case history illustrates what can be accomplished by tool sharpening controls.

MULTIPLE DRILLING: "Multiple Drilling Conical Patterns — How it is Done" by Ernest Jerome, Zagar Tool, Inc. 85

A case history — drilling 68 holes in two passes, time — 25 seconds.

AIRPOWER: "Aftercooling to — Eliminate Moisture in Compressed Air Systems" by C. N. Deverall, Niagara Blower Company 87

An analysis of what happens in the lines of a compressed air system when moisture is present is presented by Mr. Deverall. Remedies for this moisture problem are also discussed.

TOOL DESIGN: "Progressive Step Method Cuts Tool Costs in Half — Twice" 90

A case history — showing how change in product design and experimentation in tooling results in reduced costs.

SCREW THREADS: "Updating the Accuracy in Measurement of Screw Threads" by Eric G. Gabbey, O-VEE Gauge Company 91

Efforts to bring screw thread standards up-to-date, and agreement as to the type of gage to use in gaging threads are discussed by the author.

DEPARTMENTS

MANUFACTURING MEMOS 46
COMMENDABLE COMMENTS 47
WILL YOU BE THERE? 54
GROWING PAINS 143
MEN YOU SHOULD KNOW 144
WHAT'S NEW IN PLASTICS 146
CALLING CARDS 150

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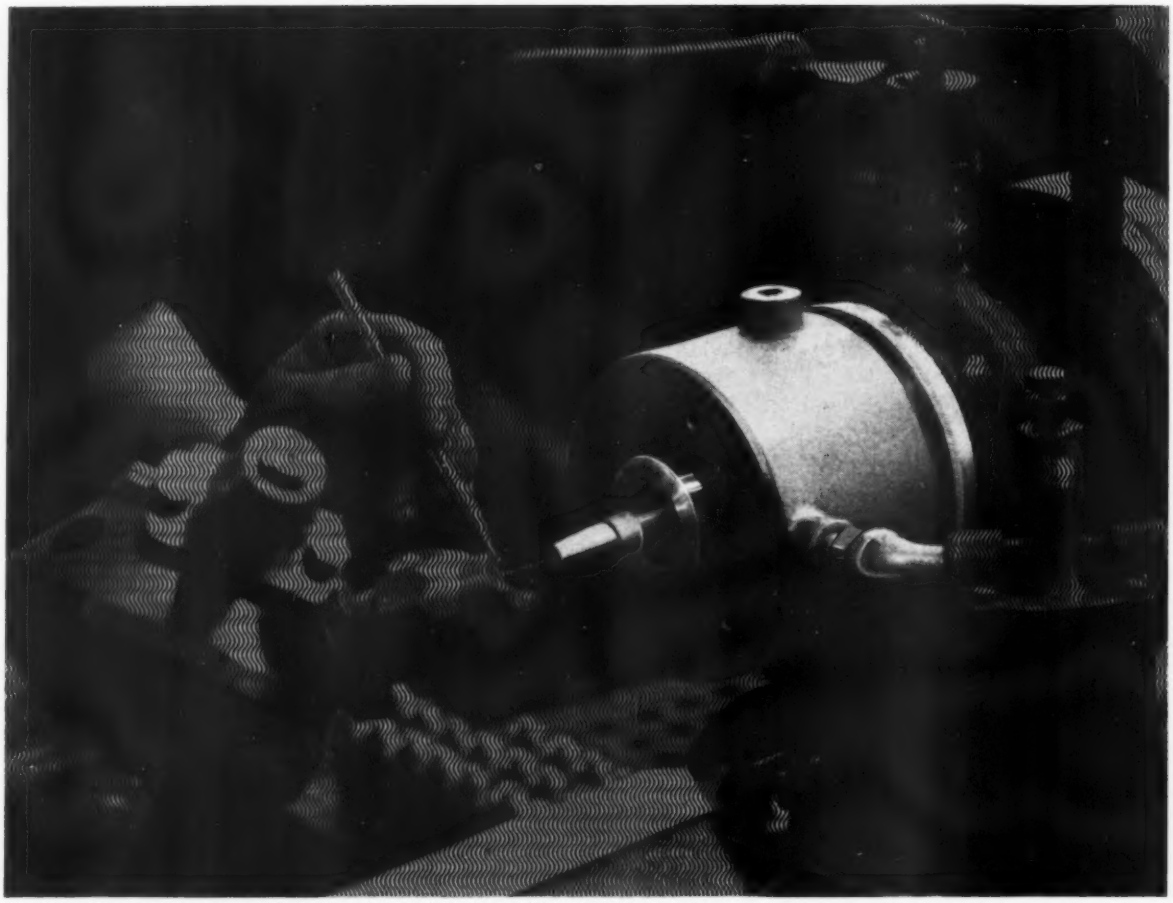
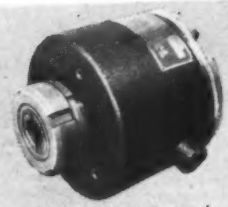


Photo: *Courtesy Harris Calorific Company, Cleveland, oldest and largest independent producer of gas welding and cutting equipment in the country.*

ERICKSON AIR CHUCKS

a hot tip for cutting costs on cutting-torch tips



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"We have used Erickson Chucks since 1942 . . . and would recommend Ericksons to any plant which wants to increase production . . ." That is the report from Harris Calorific Company, big-name manufacturer of gas cutting and welding equipment.

The company uses four No. 400 Erickson Air Chucks for finishing leaded copper cutting-torch tips. Operations consist of drilling, reaming and polishing—at the rate of approximately *100 pieces per hour per chuck*.

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FLOATING HOLDERS	EXPANDING MANDRELS
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guest editorial*

Mathematics In Engineering

"THE PRESENT RAPID RATE of development in the various engineering disciplines is bringing the research engineer and the design engineer into an increasingly intimate contact with the mathematical sciences. Classical mathematics sees a wider and wider application; newer fields of mathematics become more and more significant.

"Certain classical fields of mathematical analysis — such as differential equations, function theory, and the calculus of variations — see continual engineering usage. Yet much research in these fields is being done, and remains to be done, by both the mathematician and the engineer; nonlinear phenomena are cases in point.

"Mathematical statistics has become an important tool of the design and test engineer. Probability theory and the theories of statistical estimation find important application in the fields of guidance and control.

"The theory of probability, with particular emphasis upon stochastic processes, is the basis of much of the work in modern electrical engineering and communications engineering.

"The use of probabilistic and statistical models to describe complex engineering systems and to formulate design criteria for such systems is becoming increasingly widespread.

"The wartime 'operations research' and the former engineering 'common sense' have evolved to include a broader mathematical structure, exemplified by linear and nonlinear programming and the theory of games; this has led to certain broad scientific principles useful in the analysis and synthesis of complex engineering systems.

"The advent of high-speed computing machines has given the engineer another important tool for analysis and synthesis, and has given rise to fresh developments in an old mathematical field — numerical analysis.

"All of these aspects, and many more, exemplify the great and ever-increasing role mathematics is playing in engineering. Certainly this trend will continue. This calls for the greatest possible interchange of information and co-ordination of effort between the mathematician and the engineer.

"The engineer must be informed of the advances in the mathematical theories useful to his field of practice; the mathematician must know of the requirements of the engineer for advances in particular mathematical areas. Continuing evaluation is required of the possible role in engineering of the newer fields and advances of mathematics.

"And all of this makes necessary a continuing assessment of the role of mathematics in both the undergraduate and the graduate engineering curriculums."

**From the printed program of the Conference on Mathematics in Engineering, held at the University of Michigan, June 20-22, 1956. At the conference banquet, the guest speaker was George J. Huebner, Jr., Executive Engineer — Research, Chrysler Corporation. His fascinating topic, "The Power of the Computer," is presented as our "Talk of the Month," page 12.—E. W. P., Editor.*

Some Questions and Answers On - - -

MILLING WITH CARBIDES

One of the 1956 programs of the ASTE-Cleveland Chapter, Carbides Section, was devoted to "Milling With Carbides." A top-flight panel of guest speakers was made up of:

J. R. Roubik
Research Engineer
Kearney & Trecker Corporation
Milwaukee, Wisconsin

Lewis H. Goddard
Vice President—Sales
Goddard & Goddard Company
Detroit, Michigan

Warren D. Getchell
Consulting Engineer
McCrosky Tool Corporation
Meadville, Pennsylvania

Glenn D. Easton
Chief Engineer
Lovejoy Tool Company, Inc.
Springfield, Vermont

After the formal presentations, questions were submitted by the audience and answered collectively by the panel. We have briefed and combined the panel's answers to each question. Thus, no consolidated answer in the following should be attributed to any one panel member. It was a group effort and is so reported. E.W.P. Editor.

1. When Making a 3/16" to 5/16" Depth of Cut, With Carbide Tipped Milling Cutters, How Many Passes Would You Advise?

Carbide shell or face mills will remove 5/16" or more stock (depth of cut) in any usual material in one pass if the machine tool, workpiece and/or fixture can stand it. Consideration should be given to the geometry of the workpiece and the manner in which it is held. A fragile casting, or one which cannot be clamped securely, may limit cutting forces.

In general, it may be said that if one of the above factors limits the operation, it is better to take two or more cuts at the proper speeds and feeds than to attempt one pass at reduced feed with the consequent sacrifice of tool life between grinds. Under ideal conditions a fair to good finish can be expected from one pass, but under less than ideal conditions, more than one pass would be recommended both to obtain finish and dimensional accuracy.

2. What is the Recommended Stock Removal for a Finish Cut to Obtain a Favorable Micro Finish? In Using Carbide Tipped Shell End Mills, or Gang Mills, Would You Also Increase SFPM to Obtain a Favorable Micro Finish?

The optimum surface finish can usually be obtained with depths of cut of about 1/16" in the case of heat treated alloy steels. Increased peripheral speed will also improve finish. In the general run of cases, increase sfpm 25%. However, there are several conditions more important than depth of cut if the best surface finish is to result.

A poorly ground cutter cannot generate smooth surfaces since each tooth must cut the same depth to achieve a good surface finish.

The mounting of the cutter must be such that a minimum of wobble or runout occurs. The machine must be in good condition as any chatter caused by loose spindle, worn gearing or irregular table feed will make it impossible to attain a good finish.

Cutting speeds should be high enough so that very little or no built-up edge occurs. A built-up edge on the cutting tool will tend to rub off on the finished surface, spoiling its appearance and increasing its roughness.

In general, cutting speed has the greatest influence on surface finish. Rough finishes are associated with low speeds and fine finishes with high speeds. Therefore, an increase in cutting speed along with a relatively fine feed per tooth would be recommended to improve surface finish. It should be realized that recommendations for improving surface finish are diametrically opposite to recommendations for improving tool life.

3. What is the Recommended OD Relief for Gang Milling Cutters such as Half-Side and Slotting Cutters; also, Shell End Mills Cutting Heat Treated Material from 40 to 44, 46 to 48, and 50 to 53 R/c?

Peripheral relief should be as low as possible without allowing the heel of the land to drag on the work or to load with displaced work material. Small diameter cutters on soft material may require as much as 15° to 20° relief, and medium to large cutters on hard material, as little as 3° or 4° relief. For steels in the 40-50 R/c range, 4° to 5° is a good general figure.

The peripheral relief for arbor-mounted cutters such as slotting cutters, side mills, etc., is 4° or 5°. Shell end mills and other face milling cutters may be ground with peripheral reliefs of 5° for 14″ diameter cutters and over, down to 8° for 3″ diameter cutters.

The values given above are for the primary reliefs which generally should not exceed ⅛″ in width. Secondary reliefs 10° greater should be ground to avoid interference at the heel of the blade.

When secondary reliefs have been ground, less stock is removed in grinding the final primary clearance, reducing wheel wear and improving accuracy.

In milling hardened steels with carbides, it is desirable to have as great an included angle as practical between the relief face and the rake face along which the chip slides. A value of at least 90° is recommended. With a negative rake ridge or flat at the cutting edge of a blade disposed at a positive rake angle this can be done easily with relief angles of 4° to 6°. Such a combination permits resharpening with removal of the least amount of carbide. The same relief could be applied to a straight negative rake cutter, but regrinding would not be as economical.

4. What are the General Standards on Side or Face Dish for Half Side Mills, Slotting Cutters and Shell End Mills, for Cutting Steel, Before Heat Treat and After Heat Treat?

The general standards for grinding dish for half side mills, slotting cutters and shell end mills should be 3° for steel before heat treating and 2° after heat treat.

Reducing the dish angle tends to improve the finish of the machined surface, and, in the case of slotting cutters, helps to maintain the width of cut. Dish or concavity prevents dragging and provides clearances in the cut. Where finish is not important, it may range from a few thousandths per inch to about a degree. Where finish is important, a slotting cutter may have 0° on the side, and a face mill 0° on its face.

A relief or dish of some sort is desirable on the type of cutters mentioned. It could be just about any reasonable value of angle (and even a definite step) just so long as a flat edge longer than the greatest feed per tooth is left on each tooth so as not to generate a saw-tooth surface. Some prefer that a flat edge greater in length than the maximum feed per revolution be left on one tooth or on every tooth, but the flat edge should not be much longer than this since that would cause an unnecessary scraping action which would be detrimental.

5. When Not Milling to a Square Shoulder, for Best Results Would a Corner Radius be Ground or a 45° Chamfer?

A corner chamfer of 45° (where permissible) stands up better and is simpler to grind than a radius. For general use, a 1/32″ to 1/16″ chamfer is best. A 35° chamfer gives enough shear, and the cut is not as long as a 45° chamfer or a radius. The length of chamfer should be slightly longer than the depth of cut to be taken.

Experience has shown that a corner, or lead, angle is always beneficial when a square shoulder is not required. In general, the cost of grinding a radius on the corner of a milling cutter is not justified unless the part specifications require it. However, the corner angle will reduce the shock caused by the blades entering the cut, and prolong the life of the cutter.

Corner angles of 30° or 15° may be used with beneficial results when the depth of cut exceeds the capacity of the 45° angle. As the corner angle or radius is increased, affording increased tool life, the thrust forces on the cut-

ter as well as the work surface also increase. However, unless the spindle, workpiece and fixture are capable of suitably absorbing the increased and intermittent thrust forces, the tendency to chatter will also increase with an increase in corner angle or radius.

6. When Milling Heat Treated Material Up to 53 R/c, Using Any Type of Carbide Milling Cutter, Would a Positive Axial Rake and a Negative Radial Rake Be Used, or a Negative Axial With a Negative Radial Rake?

Generally, when face milling hard steel use negative axial and negative radial. For slotting hard steel use positive axial and negative radial rakes. However, for milling 53 R/c material the cutter might well be engineered for the job. The chip disposal problem and desired direction of chip flow will have a bearing on both radial and axial rake angles and as to whether either or both are negative or positive.

Further, material of this hardness might be cut with a slight positive axial rake and a negative radial rake providing a corner angle was included, but, in general, the double negative rakes would be employed. The cutting forces required to remove the chip from high tensile strength material necessitate a well supported cutting edge.

The large volume of carbide obtained with negative cutting angles provides the supporting strength, and helps to absorb heat from the cutting edge and dissipate it through the tool shank.

7. What Grade of Carbide Should Be Used on Heat Treated Material Up to 53 R/c?

Grade of carbide for heat treated material up to 53 R/c depends on several factors. Light finishing cuts may require the harder cast iron grades, and more rugged cuts the tougher steel cutting grades. The carbide should be one combining toughness and wear resistance, but designed for heavy duty machining. This grade will have a grain structure and rigidity built into the material which will resist the high heat encountered. Grades containing titanium will be found best and are listed under class 6 in most carbide grade comparison charts.

Because, in this case, the difference between the hardness of the tool and of the workpiece is diminished, the hardest grade of carbide should be used that will stand up under the inherent interrupted cutting action in milling. In using harder grades of tool material, it is imperative that the entire machining setup be very rigid and that vibration be at a minimum.

8. What is the Recommended SFPM and FPT for Machining 4140 and 4340 Forging and also the Same Material Heat Treated to 40-44, 46-48, and 50-53 R/c? What Would the Expected Tool Life Be?

Peripheral speed and feed per tooth depend on several factors beside the hardness of material; such factors as rigidity, dimensions of cut, finish requirements, etc. Roughly, speed should range from 150 sfpm for 40 R/c to as low as 50 sfpm for 53 R/c. Feed per tooth should be from .005″ to .010″, also depending on many other factors.

Other recommendations for the above materials in the annealed state run as high as 400 sfpm, with a feed of from .005″ to .012″ per tooth. After heat treatment, cutting speeds may be reduced approximately as follows: 42 R/c, 200 sfpm; 48 R/c, 150 sfpm; 50 R/c, 100 sfpm; and at 54 R/c, 75 sfpm. The feed per tooth should not exceed .010″, and best results will probably be obtained in the .004″ to .006″ range.

Tool life is affected by too many variables to permit any consistent measure. There can be no reliable estimate until after a few cuts are made and the conditions observed. In general, where a feather edge chip is produced (as in plain milling or slotting), tool life is low. Where a feather edge chip or zero chip thickness (found in many face milling operations) can be avoided, tool life is much better—even up to 10 times better than the former. Tool life in terms of cubic inch of material removed per inch of cutting edge is, in general, greater for roughing conditions than for finishing.

9. What Is the Recommended SFPM and FPT for Machining Aluminum Forgings, Heat Treated to 65,000 psi?

Aluminum is generally machined at the highest speed available on the machine. Starting with 500 sfpm and .003″ fpt, recommendations carry up to where speeds of 1,000 to 2,000 sfpm, and feeds of .005″ to .020″ fpt are suggested.

end

Arbor Helps

Boost Gear Production

MANY OF THE DIFFICULTIES encountered in machining splined bore gear blanks with accuracy and speed have been eliminated by the Frank G. Hough Co. of Libertyville, Illinois. In addition to simplifying the task of maintaining precision, this firm has increased production by 10 to 15%, reduced downtime, and at the same time made the machinist's job easier.

All these benefits result from the use of Pin-Type arbors made by Scully-Jones and Company.

Designed with regularly spaced pins around the arbor body, in operation a workpiece is loaded on the arbor and the pins fit into the internal splined bore. When the piece is rotated, the pins move up ramp-type cams and are forced into line contact with adjacent splines near the pitch line. The part is then firmly locked to the arbor because the pins apply equal force all around the splined bore to eliminate play and improve accuracy. Thrust from turning or grinding operations keeps the piece from loosening.

The arbors are used at the Hough plant for turning, facing and beveling transmission gear blanks. Records there show a 10 to 15% production boost and improved accuracy of the finished gears when the Pin-Type arbors are used. A Fay 20″ automatic lathe is used for the operation and 0.250″ of stock is removed on the O.D. at a feed of 0.010″ and speed of 460 sfpm. Carbide tools on the front slide of the lathe cut the O.D. and face the hub, while tools mounted upside down on the back slide plunge feed to face the gear flange.

The machinists handling this operation welcome the ease with which they maintain accuracy, but they are especially pleased with the simplicity of handling parts on and off the arbors. Putting a blank on the arbor involves no more exertion than a twist of the wrist. Arbor presses are not used, and machine downtime is reduced considerably because more parts are handled per day.

The arbors also facilitate the machining of the hub and face absolutely square with the bore. Thus, by holding close tolerances on the face it is possible to use backing plates and spacing collars to apply clamping pressure to a stack of gear blanks without fear of springing the arbor or gear blank, and introducing error.

end

Fig. 1. Arbor presses are not needed for placing splined bore gear blanks on a Pin-Type arbor.

Fig. 2. Pin-Type arbors hold the workpiece securely, for precise machining.

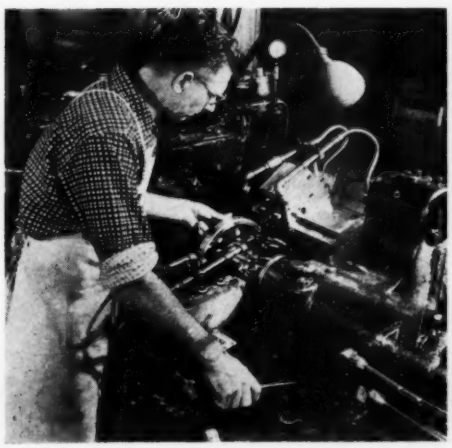
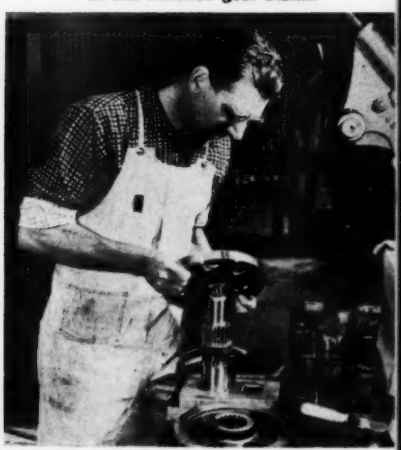


Fig. 3. A twist of the wrist releases the pins from the splined bore for easy removal of the finished gear blank.



MECHANIZED ASSEMBLY LINE SPEEDS LOCK PRODUCTION

by R. D. Ennen
Superintendent
STANDARD PRODUCTS CO.
Cleveland, Ohio

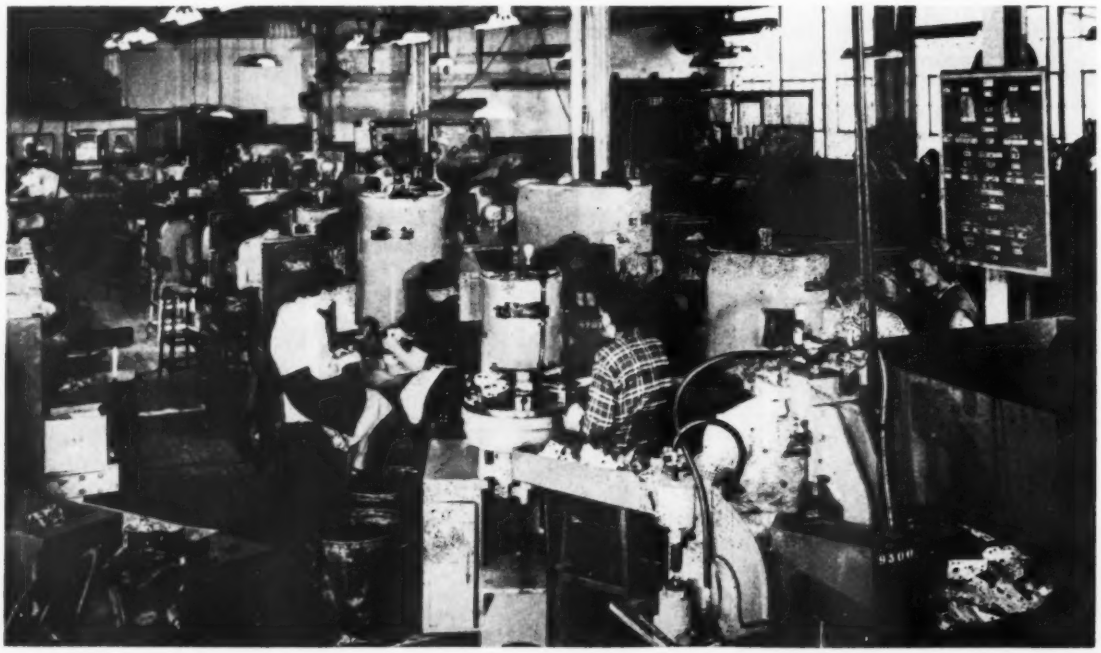
THE SWELLING OF AUTOMOTIVE PRODUCTION to new yearly highs has made automation or partial automation at supplier plants a must wherever possible.

Standard Products Company's Reid Products Division in Cleveland is saving time and money by using a connected line of small, high speed Multipresses, manufactured by The Denison Engineering Co. of Columbus, Ohio, to speed up production of car door locks which Standard Products Company supplies to the auto industry

The hydraulic presses not only work faster, but give more positive tolerances and, because of automatic staking and ejection operations, are less subject to human error.

The lock assembly line, which starts with the lock base plate and turns out a product ready to be packed for shipment, consists of 13 Multipresses of various capacities equipped with indexing tables. Only manual part of the operation, in most cases, is the loading of parts, which is done by one to three women operators at each press. Behind the press line

Fig. 1. Overall look at the Standard Products lock production line. Assembly operations start in foreground, with completed door locks turned out at the other end.



is a system of chutes and conveyors which move the sub-assemblies from station to station. Parts to be attached to the lock base plate on its trip through the line are stored in bins immediately adjacent to the indexing stations of the presses.

The line can produce as many as 10,000 lock assemblies per shift. Average monthly production on the line is 200,000 locks per month. The presses, plus conveyor equipment, are all contained in floor space of approximately 500 sq ft. Within this space, 26 parts are assembled in the complete operation. A total of 26 people, plus six inspectors, pilot the operation.

The line starts with a small press which fits and sizes a small bushing into the base plate of the door latch assembly. From this station, the piece is carried up a chute and then down by gravity to the first Multipress in the line. Here the operator removes the base plate with its bushing from the chute, mounts it on the press indexing table, and places a small stud on the base plate. As the indexing table swings around (there are 26 movements per minute) the stud is staked and, as the index is completed, a cam pushes the piece up and a kicker-arm ejects the sub-assembly from the press onto the next station.

This ejector arm can be held back by the operator by pushing a footpedal, so that in case the operator fails to place a sub-assembly on at the right time, or the part is not properly staked, it can be returned without shutting off the machine, or sending faulty parts further along the line.

At press No. 2 three operators position the base plates on the indexing table, adding a stud, rubber sleeve and rivet. This assembly is then staked, automatically sprayed with lubricant, and ejected from the machine.

The first operator at press No. 3 places a small cam in the holding fixture on the indexing table and puts the lock plate over the cam. Another operator then adds two rivets. This assembly is then staked and riveted and sent to the next station. At this point, press No. 4, a small cam and lever-door lock key are installed.

From press No. 4 the lock plate with its positioned assemblies is channeled to a chute leading to a testing and inspection station, where the half-completed locks are screened by inspectors. This half-way point inspection cuts down substantially the number of rejects at final inspection.

Press No. 7 forms a sub-assembly consisting of a stud, washer, spring and lever arms, which are staked together by the ram of that press.

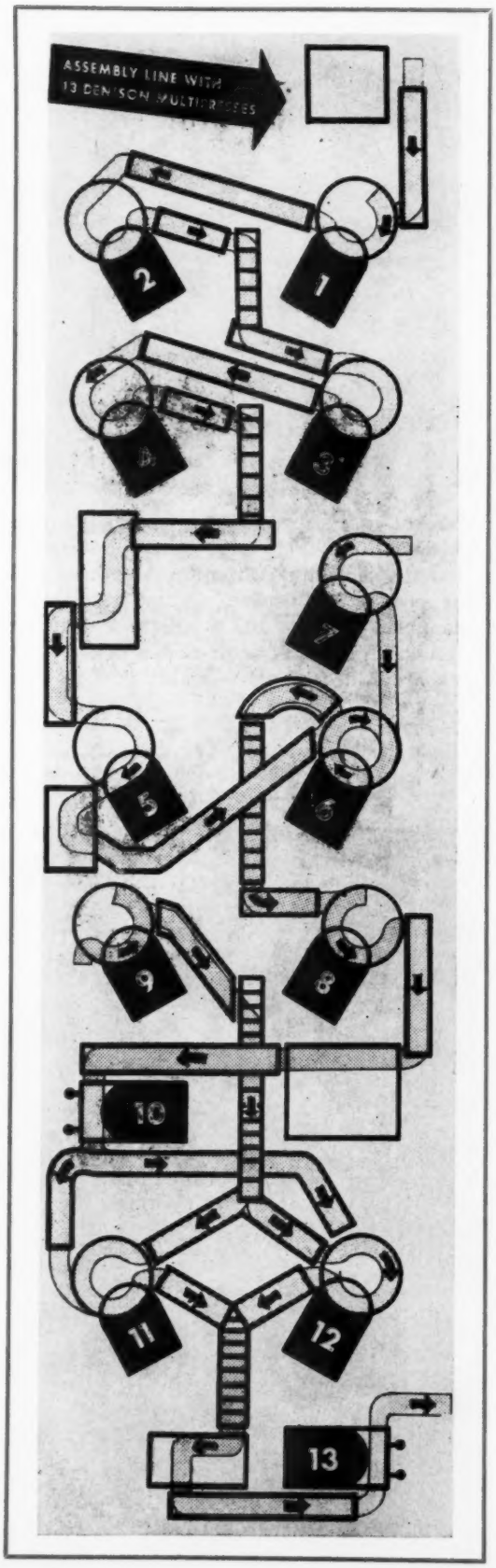


Fig. 2. Assembly and staking operation. Close-up at station No. 1 (first Multipress) shows ejector arm swung back ready to push staked assembly on to the next station.

This sub-assembly is then channeled to press No. 6.

At the same time, after the lock base plate has passed its inspection, that assembly is channeled to press No. 5, where a door lock rotor, a shield lock rotor and a ratchet door lock are added. This assembly is then channeled to press No. 6, where it meets the sub-assembly coming from press No. 7.

Two of the three operators at press No. 6 add identical studs and washers, while the other operator positions the assembly and also adds a lever arm. After staking, the entire piece is then sent on to press No. 8.

At this point one operator positions the work in a fixture on the indexing table and adds a pawl lock ratchet. Another operator puts on a rivet, ratchet pawl and a washer, and then the assembly is staked. The first operator unloads the part manually (the assembly is now too delicate and intricate to use an automatic kicker-arm), and puts it in a chute which leads to an assembly bench where a small spring is placed in position. The work is then channeled to press No. 10. At this point the spring is staked to the assembly.

A sub-assembly comprised of an outside handle release, an outside lever release, a rivet and a spring washer is made on press No. 9.

Fig. 3. Close-up view of two operators loading parts for sub-assembly at press No. 5. Adjustable speed of ram and index table make it possible for operators to maintain a steady flow of production.

Fig. 4. Press No. 7 forms a sub-assembly consisting of a stud, washer, spring, and lever arm, which are staked together on the ram of this press.

After staking, the parts are manually unloaded and placed in a conveyor which moves them to presses No. 11 and No. 12.

These presses perform identical operations—the sub-assemblies from press No. 9 are added to the main assembly from press No. 10. A stud lock arm and spring washer are also added. From this point the output of both presses is sent to a bench station where another spring is added. From the bench station the parts are moved to the last press, No. 13, where the spring put on at the bench station is staked.

From the press line the now finished locks are moved by conveyor to a final inspection station, where each lock is carefully checked. From here the locks are moved, still on the conveyor, to a grease dipping tank, where each lock is immersed in a dilute solution of Lubriplate. Heavier solutions of Lubriplate are applied by automatic spigots to parts at several of the presses as the assembly moves through the line.

After the final grease dip, the locks move on the conveyor to the packagers who box the locks for shipment.

The table indexing speed of the presses, as well as ram-stroke timing, is adjustable over a wide range, so that operations can be suitably timed to provide a continuous and uninterrupted flow of work over the entire line. There is no necessity to synchronize the movements of all the indexing tables, since storage bins can take care of moderate overflows. This feature is valuable when training inexperienced operators, as the operation can be slowed down until they become adept in handling parts and loading fixtures.

Use of hydraulic presses has enabled Standard Products Co. to exert closer control over tolerances which are required in the newer safety type locks now appearing on many passenger automobiles. Indexing and automatic staking increase efficiency of the operator due to his confidence in the safety of the machine.

End

Fig. 5. View of production line shows parts moving to final spring staking operation (press No. 13 in left foreground), after spring has been added at bench station.

Special Fixturing Permits

HIGH-VOLUME BELT GRINDING

by George D. Miller
Chief Industrial Engineer
JENSEN MANUFACTURING COMPANY
Chicago, Illinois

BY USING A MOTORIZED belt-feed attachment mounted on an Engelberg abrasive belt grinder, steel magnet cases for loudspeaker assemblies are uniformly surfaced by the Jensen Manufacturing Company in five seconds, with single-pass stock removal of 0.015″ to 0.020″.

The mild steel, S.A.E. 1010, 8-12 carbon U-shaped cases are ¼″ thick, 2⅛″ wide, and 1″ high. The case ends must be flat and parallel (within 0.001″) to the coined surface of the top plate in which the cylindrical magnet is seated. This flat, uniform surface finish is required to insure a satisfactory magnetic-field contact when the ends are projection welded to the plate as shown in Figure 1.

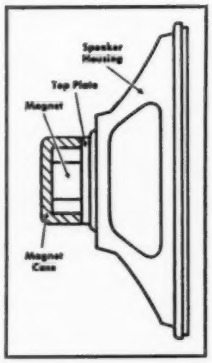


Fig. 1. Sketch of magnetic structure assembly mounted on speaker housing. Belt-ground ends of magnet cases are projection welded to top plates.

Fig. 2. Operator loads magnet cases manually, simply fitting them, ends in, on the feed bar to contact the revolving feed belt which carries them across the abrasive belt. Arrow points out the motor for the belt-feed attachment.

After blanking and forming operations, the cases are processed on an Engelberg Model BG-8 wet-belt platen grinder. The belt-feed motor is mounted on the main frame of the machine between the coolant tank and machine table (see arrow Fig. 2). A series of sheaves and reduction gears transmit power to the feed attachment to produce a feed-belt speed of 27 ipm. To prevent slippage of the feed belt, the surface of the steel drive drum is knurled. An auxiliary drum outside the belt provides additional tension and further insures slip-free belt revolution. The drums, mounted on the 12¼″ by 20″ worktable, are 3″ in diameter. The endless feed belt, of tufted vulcanized rubber, is 6″ high, 48″ long, and 5/16″ thick.

The machine operator places the magnet cases on either one of two hardened steel bars (Fig. 3). The bars, 1½″ high, are mounted and spaced outward from the steel backing plate on either side of the removable platen. They are set so that after stock removal of 0.015″ to 0.020″, the legs of finished cases measure ¾″ on inside, +0.010″, —0.000. The bar fixture is adjustable in thousandths to compensate for belt wear.

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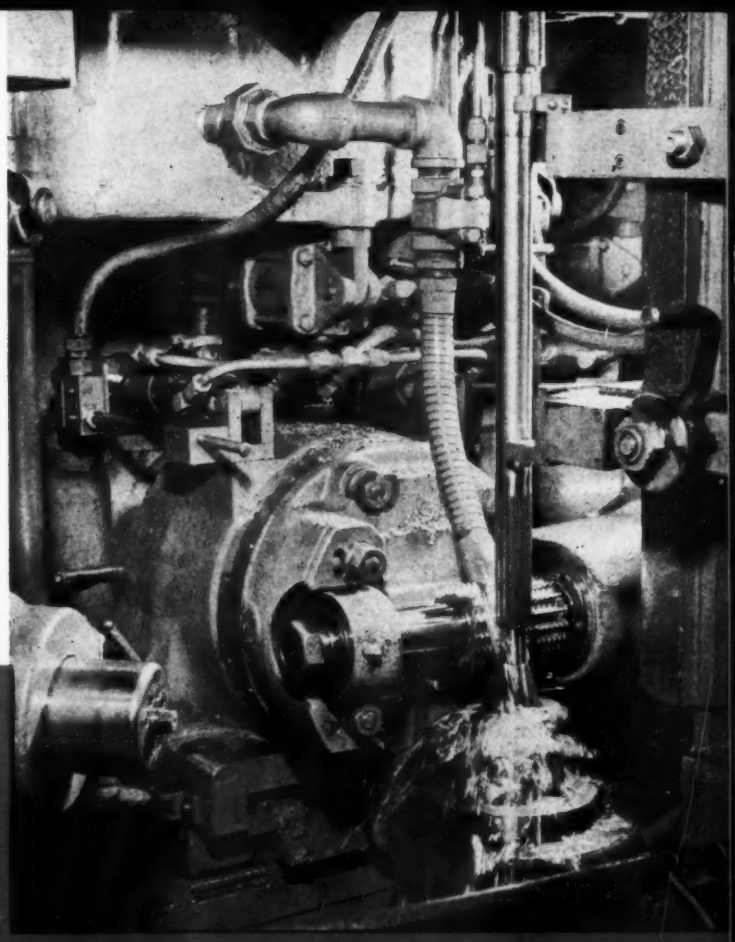


HOB IN ACTION is shown in this view of transmission mainshaft spline being cut. The Cleveland Hobbing machine, having eight hobs in action at one time, is equipped with red lights that warn when any individual hob must be removed for sharpening.

Hob Life Increased 5:1

CONTROL PROGRAM UPS PERFORMANCE OF PRECISION TOOLS

THE USEFUL LIFE of precision cutting tools such as broaches, hobs and gear shapers can be increased up to five times by substituting simple but scientific sharpening procedures for guess-work. This is the story of how one major auto manufacturer achieved these savings.

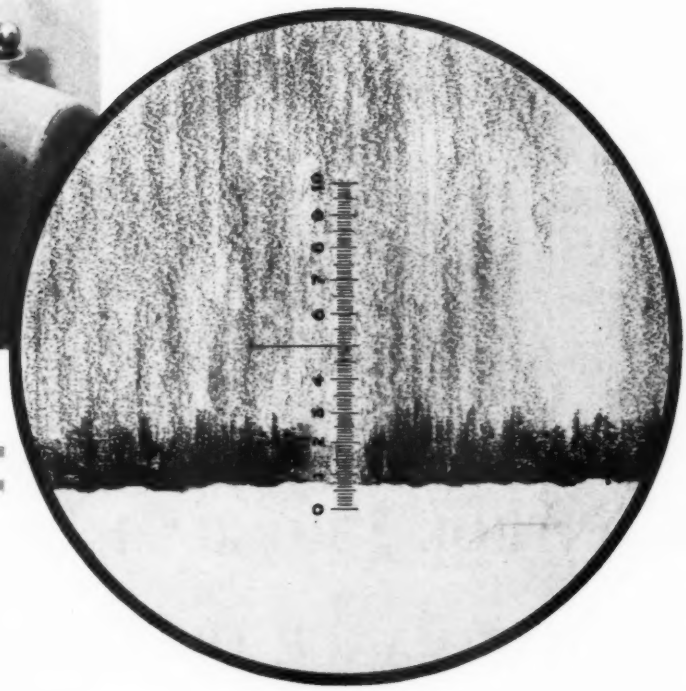
It is a common practice in manufacturing plants to route precision tools directly to the sharpening department when they become dull. The sharpener gives the tool a visual check to determine the maximum amount of wear or peel. He then grinds off what he considers to be the necessary amount of stock. To be on the safe side, however, he will also frequently grind off an additional 0.010 to 0.030 of an inch.

This is very expensive tool sharpening. A 3 x 3 hob, for example, may cost $70. The teeth on such a hob may have approximately 0.340" of usable stock. If 0.030" is removed at each sharpening when the maximum dullness is only 0.010" (as frequently happens), the tool may realize only 1/5 of its potential useful life.

To cut this waste of tools, many manufacturers are installing simple tool sharpening controls. Heart of the system is a wide-field three-dimensional microscope equipped with a micrometer eye-piece scale that provides a quick measurement of the actual amount of wear or peel on a tool.

A typical case in point is found at General Motors' Chevrolet-Saginaw Transmission Plant in Saginaw, Michigan. A stereomicro-

3-D INSPECTION is made on gear hob by inspector Matt Fogle to determine maximum amount of peel. Bausch & Lomb stereomicroscope is equipped with micrometer eyepiece scale which measures peel as it is studied.



GEAR TOOTH viewed through stereomicroscope, as visualized by artist. Micrometer eyepiece scale indicates how much of hob tooth should be removed. Inspector will line up zero point with edge of tooth and measure width of dark, worn area. He will issue instructions to hob-sharpening department for removal of 0.002".

scope was set up in a tool crib, and with a system of controls, produced considerable savings on tool costs, in addition to many other benefits. The stereomicroscope is a product of the Bausch & Lomb Optical Co., Rochester, New York, whose Detroit sales engineers installed the apparatus and trained Chevrolet tool inspectors in its use.

The master mechanics' department at the Chevrolet-Saginaw plant set up four objectives for their hob sharpening control program:

1. Increase the life of tools by removing only the necessary dullness.
2. Determine how many pieces should be produced per sharpening without sacrifice of quality or tool life.
3. Improve and control the quality of sharpened tools.
4. Produce accurate records to determine tool costs per part made.

The Problem

Tool engineers know it is important to keep cutting tools in good condition. The quickest way to waste a tool is to use it too long. A sharp hob will cut cleaner, use less power, produce gears having a higher degree of accuracy and finish, wear longer, and require less servicing than one that is permitted to become excessively dull.

Chevrolet engineers, who at the time were working with 5145 steel, found that hob teeth peeled an average of 0.045" for a given number of pieces before the wear became critical. After it passed that point, rapid deterioration

up to as much as 0.108" would set in, wasting much of the tool.

This peel took several different forms: abrasion wear (a uniform dulling of the cutting edge); flank gouge (formation of a groove or cavity in the side of the tooth); edge breakdown (crumbling of the cutting edge); and corner wear (breakdown of the tooth corner).

Factors which contributed to this peel or wear included hardness of stock; uniformity of grain size; process of normalization; speed and feed of cutting; quality and quantity of coolant; shift on the hob during the cutting operation; and some irregularities in the hobbing machine, climb or conventional cutting, cutting with or against blank rotation.

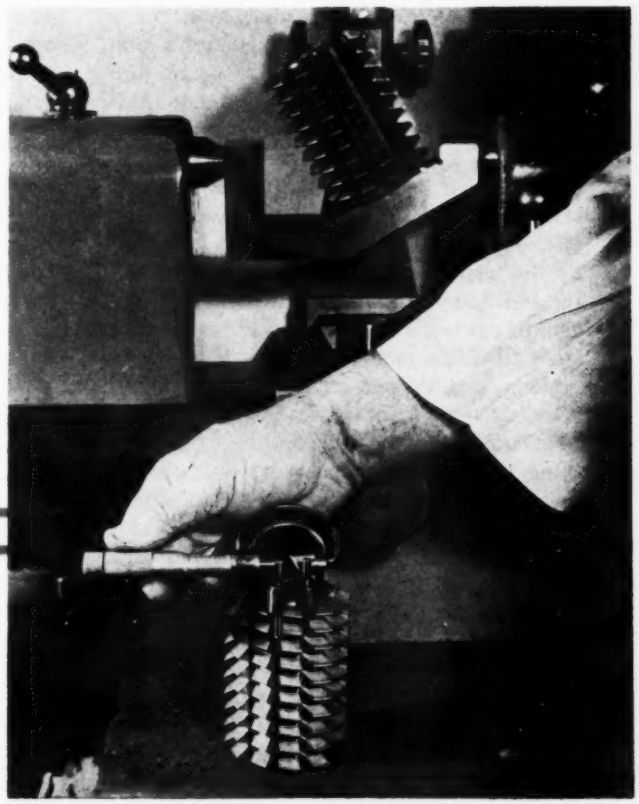
The Solution

Chevrolet engineers observed that they spent quite a bit of time inspecting new hobs and other cutting tools as they arrived in the plant, but spent little time inspecting sharpened tools. The following action was taken to correct the problem:

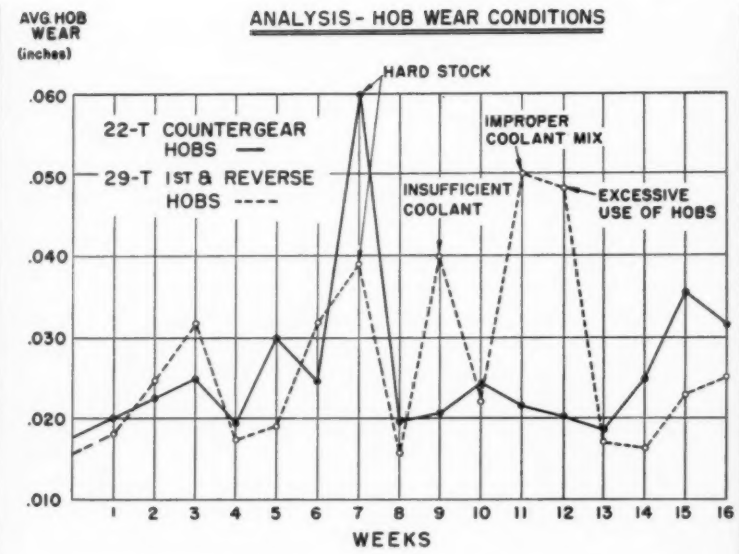
- They purchased a Bausch & Lomb stereomicroscope equipped with a micrometer eyepiece scale and 15X wide-field lens system.
- The 3-D microscope was set up in the tool crib on a cross carriage designed to travel longitudinally on a Sundstrand bench center. A special angled arbor was built with the aid of B & L field engineers. This permitted the hob to be inspected at the angle of the hob teeth, so that wear could be measured on the flank of hob tooth.
- A records system was set up including a Daily Hob Wear Record; Monthly Hob Use Record; Individual Hob Life Record; and a Hob Involute and Lead Angle Chart, for use when necessary.
- A special tool was built to enable inspectors to quickly measure the thickness of hob teeth with a micrometer before and after sharpening to determine the stock removal.

With this equipment, and some minor changes in shop organization, the following procedure for routing hobs was established:

1. All dull hobs, broaches and gear shaper cutters are brought to the inspection crib free from dirt and oil.
2. The cutting tools are then inspected for wear, abuse or other damage. (Special corrective measures are taken when tools are found with extreme wear or abuse.) Tools with normal wear are inspected visually. Teeth showing the greatest wear are marked with a red crayon so that they can be quickly located under the microscope.
3. The cutting tools are then inspected under the stereomicroscope, and the maximum amount of wear or peel measured with the



TWO TOOLS made specially for gear hob control program are shown here. At top, rear is the special mandrel made to hold gear hob at angle under the stereomicroscope. Below, front is shown the special jig made to permit rapid, accurate micrometer measuring of tooth width, before and after sharpening.



TOOL ROOM CHARTS kept during hob sharpening control program reveal causes of excessive tool wear. Average wear on the types of hobs over four-month period is illustrated. Sudden increases in average wear resulted from numerous causes, the most frequent of which were hard stock, coolant problems, and over-use of tools.

micrometer eyepiece. Records of the wear on each tool are filled out, and the sharpening instructions indicated on a tag attached to the tool.

4. The tool is then sent to the sharpening department. Hobs are resharpened on a Barber Colman No. 3 hob sharpener which operates automatically. (An aluminum oxide grinding wheel of medium grit, middle grade hardness and structure, and vitrified bond was found to produce best results.) From 0.001″ to 0.0015″ of stock is removed from the rows of teeth with each stroke. **Only the amount of stock specified by the inspection department is removed.**
5. In addition to periodic dressing of the grinding wheels to keep the abrasive free from "load", periodic checks of the correct spacing and proper cutting angle of the grinding machines are made with an Illinois Tool Works Model 265 measuring machine. This helps keep the hobs at proper specifications for spacing errors.
6. The sharpened hobs are returned to the tool crib and again checked with micrometers and a special measuring fixture to see if the correct amount of stock was removed during the sharpening operation.

Results Of The Program

The most immediate result of the program was an increase in tool life. There was also an increased awareness on the part of machine operators, tool inspectors, and tool sharpeners of the importance of careful hob sharpening. When everyone was shown how much waste was occurring, greater care was taken all along the line. The knowledge that complete tool records were being kept also helped minimize other wasteful or careless practices.

Charted records of hob performance revealed much useful information. Most important, the number of pieces to cut per sharpening was determined. Shipments of excessively hard gear stock which produced sudden increases in hob wear were discovered; improper coolants were quickly detected; and over-use of cutting tools was discovered.

Moreover, tool dullness characteristics at various stages of operation were determined. With the tool wear records, better decisions regarding the number of parts to be produced per sharpening were made — resulting in longer tool life, and smaller tool cost per piece. To choose the most economical tool for each operation, similar tools from various sources of supply were studied. Errors in operator technique or mechanical difficulties were also discovered and corrected.

The program at the Chevrolet-Saginaw plant has been so successful that similar control systems are being set up in other G.M. plants.

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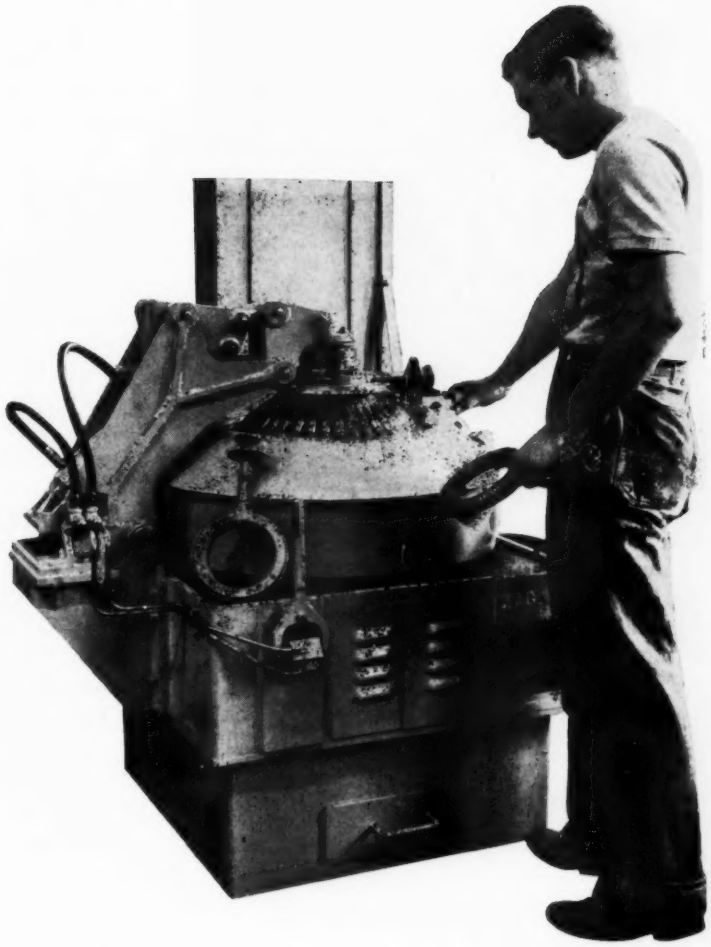


MULTIPLE DRILLING CONICAL PATTERNS

. . . how it's done

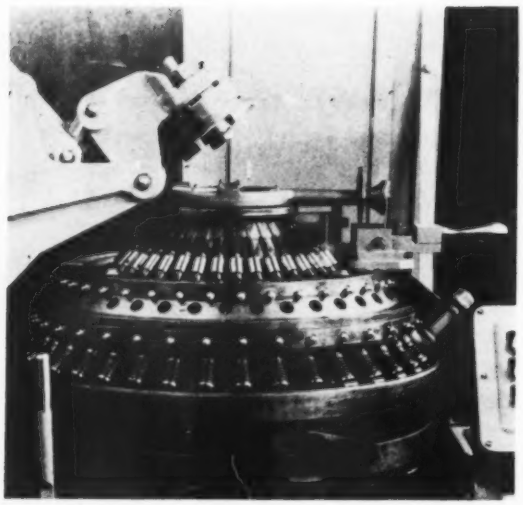
by Ernest Jerome
Project Engineer
ZAGAR TOOL, INC.
Cleveland 23, Ohio

as reported to William E. Hoffman
Associate Editor

MULTIPLE DRILLING MACHINES increase production, and enhance the possibility of uniform performance. With its multiple hole patterns, production minded manufacturers of gas burners are enjoying tremendous production advances.

The problem of drilling 68 holes, all with their centers on a conical surface, has been ingeniously handled by a Zagar-built radial drilling machine.

Although there are 68 holes, only 34 are drilled in the first position; the part is indexed and the remaining 34 holes are drilled. This drilling procedure was necessary in order to keep the machine within a reasonable size,



that the operator might reach the loading position with ease. Then too, more often than not, machine design is controlled by the economics involved — to have added another 34 spindles on closer centers would have been prohibitive.

The sequence of operations would be: (1) Load part and manually activate the pneumatic clamp. (2) Depress cycle button, which will start the spindle rotation, and in turn the feed motor for completing the first drilling stroke. Manual index will position the part in the second drilling position. (3) Depress the cycle button for the second drilling stroke. (4) Manual release pneumatic clamp, and remove finished part. Total time 25 seconds, 68 holes.

The diagram in Figure B illustrates the mechanisms for effecting the rotation of the spindle. A 3-hp motor is coupled to a speed reducer which, through spur gears actuate the drive wheel. The driven wheels are held in contact with the fibre faced drive wheel by individual springs, and rotate the spindles through keys.

The diagram in Figure A illustrates the method used to feed the spindle into the work. Starting with a fractional-hp motor driving a speed reducer, power is transmitted to a reducer cam. Through a cam roller and linkage a cam ring is rotated in a horizontal plane. The cammed surfaces of the cam ring, through rollers, move the spindle feed member vertically on keys. It is the conical upper surface of this spindle feed member, labeled cam, that moves all the spindles into the work simultaneously.

With drill breakage held to a minimum and all the holes in proper alignment, this machine has increased production five times over the old method.

end

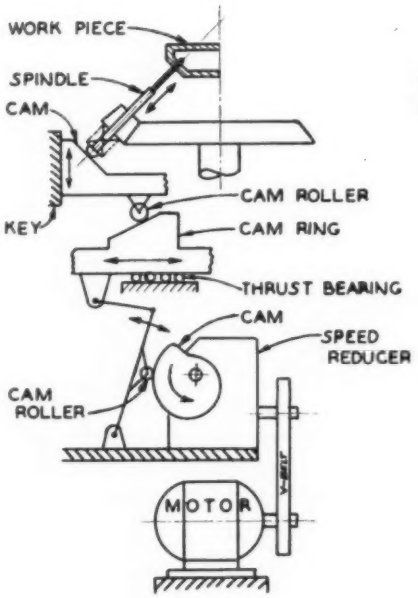


FIG. - A
SPINDLE FEED

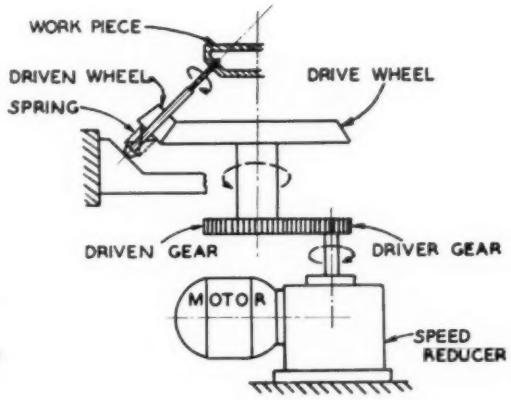


FIG.-B
SPINDLE ROTATION

ZAGAR TOOL INC.
CLEVELAND, OHIO

TOOLING & PRODUCTION
Air Power
FOR METALWORKING

Aftercooling to ELIMINATE MOISTURE IN COMPRESSED AIR SYSTEMS

COMPRESSED AIR IS USED in Industry for many purposes involving the operation of high speed, precision built air tools, such as riveters, grinders, hoists, spray-guns and certainly not the least, air cylinder applications. The wear on these tools is considerable and costly unless proper lubrication is provided. If the air used to operate them contains "free moisture," the lubricant is washed away, exhaust ports freeze up due to reduced pressure, and disastrous damage results.

by C. N. Deverall
Engineer
NIAGARA BLOWER COMPANY
Buffalo, New York

Had Your Morning "Blow-Off"?

IF YOU HAVE EVER gone to your plant in the morning to find your compressed air system inoperative, your employees standing around, and many many operations that require pneumatic power, idle — creating bottlenecks — you know full well what excessive moisture can do in your compressed air system.

On those mornings there was no pneumatic line moisture "blow-off"; as a matter of fact the compressor was not run. When started, the valve plates had been ominously noisy, and the piston-slap had been indicative of excessive wear and further trouble.

Maintenance charts had shown regular oil attention, of good grade, and . . . the thing had just been rebuilt last month.

No moisture "blow-off" that morning, no, but there was a "blow-up".

In days gone by (or have they) maintenance would oblige various department heads by blowing out the compressed air lines "first thing in the morning." The purpose of this costly repetitive operation was to clear the lines of the excess moisture that had condensed and accumulated in the cool of the night.

This practice helped, a little, momentarily; but, without the necessary adjuncts to their compressor systems to remove moisture, many gallons of water were shot through the equipment daily. Tools were dealt death blows with every actuation of a valve; many painting attempts were stopped because of the high humidity that day; and chips were blown from the work hesitantly, for fear of washing off the oil film that would arrest oxidation till the next machining operation.

As intercoolers protect compressors, aftercoolers protect the equipment down the line.

William E. Hoffman
Associate Editor

It is very important, therefore, that compressed air be as free of entrained moisture as possible. To accomplish this, equipment must be provided in the compressed air system to dehumidify the air before it enters the pipe lines.

Saturated atmospheric air at a given temperature holds a given amount of moisture in the form of vapor. Any moisture in addition to this will be in the form of free moisture or "condensate" or just plain water.

When air is compressed and cooled back to its original temperature, it can hold only a fraction of the moisture which it held at atmospheric pressure. As pressure is increased, the ability of the compressed air to hold moisture is decreased. As the temperature of the compressed air is decreased, its ability to hold moisture is decreased.

It follows, then, that the higher the pressure to which air is compressed and the lower the temperature to which it is cooled, the smaller the amount of moisture it may contain and the greater the amount of free moisture which

can be condensed from it. As an example, saturated atmospheric air at 70°F will hold 1.15 lbs of moisture/1000 cu ft of free air. If this 1000 cu ft of air were compressed to 100 psi, it would have a volume of only 126 cu ft, and in a two-stage compressor, this compression would raise its temperature to approximately 240°F.

If this 126 cu ft of compressed air were then cooled to 130°F (to which temperature it probably could be cooled due to radiation in the discharge line and receiver), it would have the ability to hold only .7 lb of moisture. Thus, nearly .5 lb of water could be drained from the bottom of the receiver and removed from the air system. The air, however, would still be saturated at 100 lbs and 130°F.

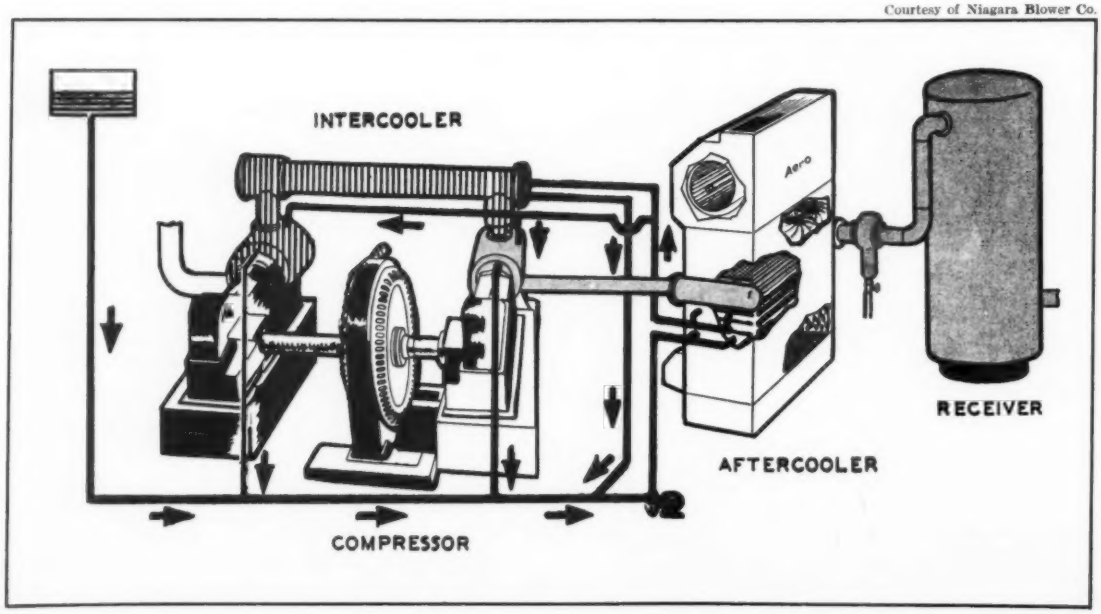
If in the pipe line, on its way to the air tools, the air is further cooled to 100°F, as it probably would be with an ambient temperature of 85° F, it could contain only .35 lb of moisture. Thus, in the pipe lines about .35 lb of moisture would be condensed out of the air and this free moisture would be available for the damaging of air tools, spoiling paintsprayed surfaces, adding free moisture to the product, or what have you. If the air were cooled to 80° instead of 100°, it could contain only .2 lb of moisture so that an additional .15 lb of free moisture would be in the pipe lines.

Most manufacturers do not permit the wholesale destruction of tools and products to go unchecked. Apparatus in the form of "after coolers" are installed, and in proportion to their efficiency more or less moisture is removed from the system. The after cooler makes use of the thermal-pressure principles described, and through the combination of increased pressure and decreased temperature free moisture is condensed out of the air. An after cooler is nothing more than a cooler placed in the discharge line between the compressor and the receiver. The hot compressed air is delivered to it and is cooled on its way to the receiver; an automatic drain removes the free moisture or condensate from the system.

If compressed air is cooled in the after cooler to the lowest temperature to which it will be subjected in the pipe line, no further condensation will occur and the lines will be free of entrained moisture. If, however, the air is not sufficiently cooled, additional "free condensate" will result. It is evident, therefore, that cooling means should be employed that will cause the air to be cooled to a temperature as close to ambient as is possible.

The water-cooled shell and tube type of after cooler does a good job, but it presents a problem in coolant supply. Water for use in these coolers may be obtained from wells, lakes, rivers, and city water systems. When these sources are utilized, the operation is generally that of a "waste water" system; the water is pumped from the source through the after cooler and wasted to the sewer. This type of cooling is called "sensible cooling" and only a few BTUs cooling can be accomplished per pound of water pumped. A large amount of water must be supplied and disposed of. As an example: with water entering the after cooler at 80° and leaving at 90°, a cooling effect of only 10 BTUs/lb of water is available.

Courtesy of Niagara Blower Co.



Shell and tube after coolers are as a rule picked on the basis of cooling to within 15° of entering water temperature. In the summer, water from city water systems or from lakes and rivers may reach 80°, and as this water temperature is seasonal and does not change with day-to-day variations in atmospheric conditions, the degree to which the compressed air can be cooled over a given period is fixed by this fixed water temperature. Ambient air temperature, however, will vary many degrees during this same period. On cool days or during night operation, when the atmospheric temperature is low, air leaves the after cooler considerably warmer than ambient due to this fixed coolant temperature.

Water from spray ponds or cooling towers may be used for the supply of shell and tube after coolers. In these systems water may be cooled to within a few degrees of the wet bulb temperature existing at the time. As the wet bulb temperature is always below the dry bulb temperature and as it rises and falls with the dry bulb temperature, evaporative cooling may be done within reasonable range of the dry bulb temperature.

Spray ponds and cooling towers cannot of course be used in many installations for physical reasons, and they present a very difficult problem in many instances due to drift from the atomized spray. Then too a great deal of water must be pumped, just as in the case of the "waste water" system.

The water spray is evaporated to cool the rest of the water which is pumped through the after cooler. The total amount of water that must be handled, therefore, is the quantity evaporated in the cooling process plus the amount required to provide circulation through the tower or spray pond. This is due to its requirement of a double heat exchange — atmospheric air to cooling water and cooling water to compressed air — which would require a spread of about 25° from atmospheric air wet bulb to final compressed air leaving temperature. For example, with 75° wet bulb air entering the tower the water may be cooled to 85° and delivered to the shell and tube after cooler, compressed air leaving the after cooler at 100°.

The fact that a cooling tower or pond seldom can be placed near the compressor further complicates matters by lengthening the pipe lines. This increases the pumping head and causes a temperature loss in the coolant.

The evaporative after cooler has come into increasing favor in the past several years. This too is installed between the compressor and the receiver. In this apparatus a special cooling coil, so manifolded as to provide an internal flow area equal to the area of the discharge line from the compressor to the receiver, is mounted in a water tight casing through which air is drawn or blown over the coils. At the same time water is sprayed over the coils, falling back into a pan at the bottom of the casing, from which it is recirculated over the coils by the circulating pump. The water level in the pan is maintained by a float control and "make up" water is supplied through this control to compensate for the water evaporated in the cooling process. The compressed air pumped through this coil is cooled by evaporation due to the action of the air drawn or blown over the wetted outside surface of the coils. The heat of evaporation is supplied by the compressed air in the coil, thus cooling the air and lowering its moisture holding capacity, and thereby dehydrating it.

This type of after cooler has many advantages. Theoretically the only water required is that used to keep the coil surface wet.

Usually this type of after cooler is provided with a separate water cooling coil for cooling the compressor jacket water. This cooling is accomplished in a closed system so that treated water, distilled water, or if necessary, antifreeze may be used. This provides an effective means of keeping the cylinder cooling passages free from scale.

The evaporative after cooler will automatically assume the proper operating range to meet all changes in atmospheric temperature, from the hottest day to practically the freezing point, by the simple process of operating on a wet bulb temperature several degrees below the dry bulb ambient temperature which tends to control the temperature in the pipe lines. When atmospheric temperatures approach the freezing point, air flow over the coils is controlled and, if necessary, cuts out the fan and turns on the heaters to prevent a freeze up.

By refrigeration, compressed air may be cooled to below the freezing point. This generally is not necessary, for the amount of moisture involved in air at 32° F and 100 lbs pressure is about .035 lbs per 1000 cu ft, which is practically negligible.

To summarize:

1. The temperature of the compressed air in itself is not of too much consequence.
2. The important point is that the air be cooled in the after cooler to or, if possible, below the lowest ambient temperature to which it may be subjected in its passage through the lines.
3. A cooling system that will accommodate atmospheric variations is necessary. **end**

The first step, a change to on-end type solid carbide inserts, resulted in a 50% cut in tool costs.

Progressive Step Method

CUTS TOOL COSTS IN HALF . . . *TWICE*

ORIGINALLY A COMBINATION OF high speed and milled-and-brazed single point carbide tools was used on a Lodge & Shipley 2A Duomatic to turn forged steering knuckles at the International Harvester Works in Fort Wayne, Indiana. On studying the operation it was discovered that the job was characterized by a fairly high tool breakage.

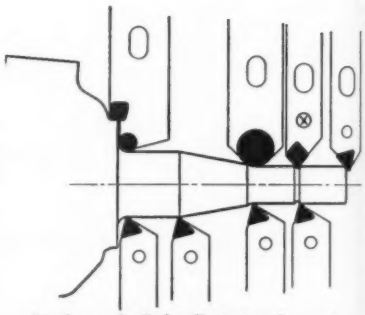
First step by International Harvester and Wesson Company tool engineers to alleviate the situation was to switch to on-end type solid carbide inserts in Multicut holders.

The result was a sizeable increase in tool life for every tool on the job, with one exception. A tool used for cutting a thread relief had the best life in the old setup. Now, while producing more pieces per grind than formerly, it was actually the worst insofar as tool life was concerned. Overall tool cost, however, had been cut more than in half.

Further changes in tool material did not increase the life of this particular tool, so the second step in improving tool life included changing the part design so that the troublesome tool could be eliminated. Another tool in the setup used for chamfering the end of the knuckle was also changed slightly to further step up its life.

After tool grades were established, adjustments in feeds and speeds, although not radical, resulted in sizeable further improvement in overall tool life and the tool costs shown in the table.

International Harvester believes that this procedure frequently results in greater savings in tool life than anticipated: First determine the best type and grade of tool for the operating range in question. Then readjust speeds and feeds to give optimum results for that particular tooling setup. It would have been easy to be satisfied with the improvement in the first setup; but, as the table shows, Harvester was able to cut tool cost practically in half again with additional experimentation. end



At the end of the first step in cost-cutting, the setup looked like this. The tool marked "X" was eliminated in the final setup by a slight change in part design, for another cut in tool costs.

Comparison of Various Methods

	Original	Step No. 1	Step No. 2
Tool Style	Milled & Brazed	Multicut & Inserts	Multicut & Inserts
Tool Material	HSS & Carbide	Wessonmetal WM & (1) HSS	Wessonmetal WM
RPM	309	309	411
Feed rate, front	.007	.007	.0118
Feed rate, rear	.0036	.0036	.008
Tool cost/100 pcs.	$7.35	$3.35	$1.75

Updating the Accuracy in Measurement of Screw Threads

by Eric G. Gabbey
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THE ACCEPTANCE STANDARD for all screw threads is the National Bureau of Standards publication, "Screw Thread Standards for Federal Services" — Handbook H.28. The last complete edition is dated 1944 but many supplements have been issued to bring the subject matter up-to-date.

Although this publication specified tolerances, definition, identification symbols and other useful data, it left the manufacturer high and dry when he sought guidance as to the best method of gaging screw threads.

Many plants go through periods when one particular thread gage is favored, then they switch to another type, then another. After a few years a plant could have half a dozen types, each differing in principle and giving different readings.

On the other hand some plants do standardize on one particular design which they consider efficient; and, even if they exercise careful control of these gages, very often parts are rejected by the ultimate user as a result of his using a different type of gage.

N.B.S. Plans to End Confusion

A meeting of the Interdepartmental Screw Thread Committee was held in July 1952 at the National Bureau of Standards to discuss these problems and to study the possibility of recommending a method of gaging screw threads which would achieve some semblance of uniformity. This recommendation, if approved, could be announced in the new edition of H.28 which is now being revised.

Generally speaking, the committee divided itself into two groups: those in favor of NO GO ring gaging and those opposed to this method. Manufacturers and users of commercial screws (also sections of the automotive industry) firmly maintain that the Low Limit should be gaged on the principle of NO GO ring gaging. The aircraft industry particularly insisted that the Low Limit should be gaged on a single element — the Pitch Diameter. On the High Limit or Maximum Metal Limit, it was generally agreed that a GO ring gage would provide the best means of control.

After a great deal of discussion the committee finally came to a decision which, stripped of all complications, can be stated as follows:

External Screw Threads to Class 3 and 3A tolerances should be gaged for acceptance by the use of a GO ring gage for the maximum metal condition; and may use actual physical measurement at the minimum metal limits which, of course, is on Pitch Diameter.

Elements Affecting Interchangeability

In order to fully understand the advantages of this, it is necessary to understand why the gaging of screw threads has been so difficult and how all the various errors in form affect fit.

Normally, the inspection consists of checking the various dimensions, one at a time, by means of fixed or indicating gages. Any variation from the specified tolerances can then be instantly located. The screw thread, however, has several varying elements, any one of which, if oversize, can defeat interchangeability. The most important of these are:

1. Major or Outside Diameter.
2. Minor or Root Diameter.
3. Pitch or Effective Diameter.
4. Angle of Thread.
5. Lead or Pitch of Thread.

These are the main elements of a thread upon which there are definite tolerances. There are also other troubles which can affect interchangeability, even if the above elements are within tolerances, the most common being out-of-roundness and drunkenness, i.e., the thread does not run true with the axis.

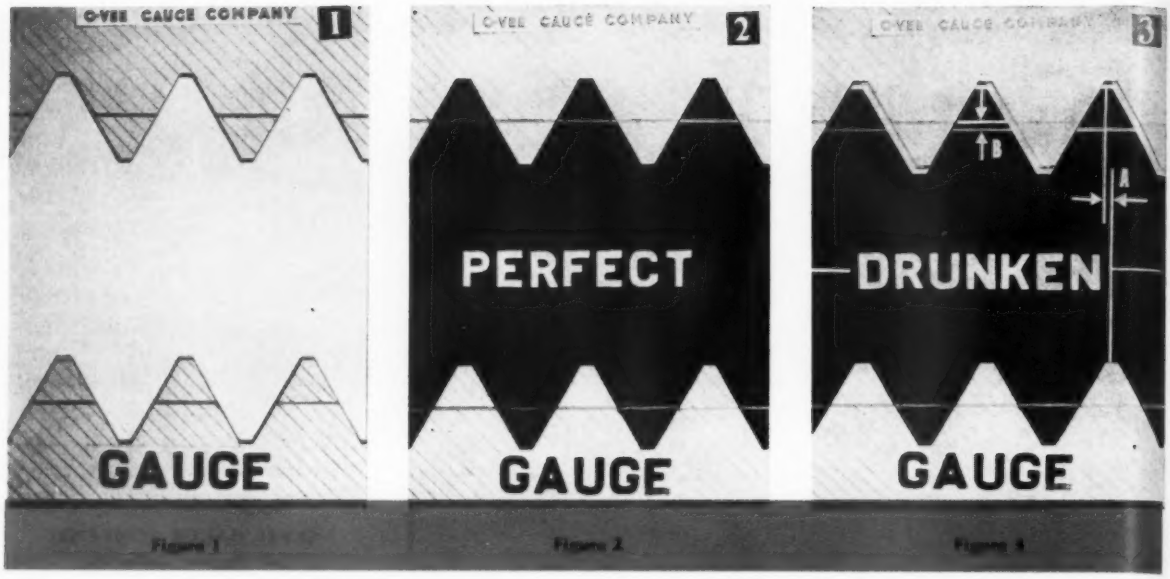
Essential Gage Requirements

It is economically impossible to check each individual element; so, gages have been specified to check the two essential features of a screw thread:

1. The screw must assemble in a nut or tapped hole of standard or basic size.
2. In order to assemble the screw, the size should not be reduced below the minimum requirements.

The National Bureau of Standards and other authorities on screw threads recommended that GO gages should check as many elements as possible. The NO GO gage, however, should only check one — the pitch diameter — for this element is the most important as it governs the strength of the screw thread.

A GO ring gage is generally considered to be the best means of ensuring interchangeability as this represents a standard threaded hole of basic size. However, it has the dis-



advantage that it wears rather rapidly. GO caliper gages are not so efficient because they will not detect an out-of-round condition, but they enjoy great popularity as they are faster in operation.

For the NO GO or minimum size, those gages in general use have a number of disadvantages. A NO GO ring gage may okay an undersized thread under any of the following conditions:

1. If the first thread is ragged or bruised.
2. If there is lead error or angle error.
3. If the part is out-of-round.

The NO GO caliper gage will give better indication as the NO GO rolls are reduced in length to check two pitches only. Although this does not neutralize, it does minimize the effect of lead error. Since there is still some lead error effect and also some angle error which is uncontrolled, the NO GO caliper gage is not the best answer.

Summarizing the above we can state that a screw thread to be acceptable must conform to two simple checks:

1. It must assemble in a standard threaded hole.
2. The size must not be reduced below the minimum specified.

Item 1 is best taken care of with a GO ring gage. If any of the elements are oversized, the part will be rejected.

Item 2 can not be accurately checked with a NO GO ring gage for the reasons already stated. The NO GO snap gage is better, but still not accurate enough.

The 3-wire method will give the most accurate determination of the low limit, as this is widely recognized as the mathematically sound method of obtaining Pitch Diameter.

From the above remarks, it will be seen that pitch diameter is the most important element of a screw thread. It should also be remembered that the tolerance of a screw is specified on pitch diameter.

Single Element Visual Aid Diagrams

It has always been difficult to visualize the effects of all the various form errors on Pitch Diameter. To analyse the problem still further, it will be necessary to study the diagrams shown in Figures 1 to 10. By taking the variations in each element, one at a time, the effects can be clearly understood. This should help considerably in deciding upon the best type of gaging equipment and in determining whether a component should or should not be accepted.

Figure 1 represents a cross section of a GO ring gage of basic size. The lines halfway down the thread indicate the Pitch Diameter which will, of course, be the High Limit since Basic Size is generally, although not always, the High Limit.

Figure 2 shows that a screw of Perfect Form will enter the GO ring gage even if the screw is to the High Limit. This is the effect which would be experienced if a GO setting plug enters the GO ring gage snugly although the Pitch Diameter is Basic.

It is important to mention here that for purposes of simplicity all gage tolerances have been ignored.

Figure 3 shows a Drunken Thread inserted in the GO gage. For those not familiar with the term, it is sometimes known as Helix Variation. It is generally caused by misalignment of the die head or screw cutting means, and the general effect is to cause a nut or gage to run out of truth when spinning it on such a thread.

To illustrate this still further, the diagram shows that normally an accurately formed screw thread has the centerline of the root diametrically opposite the crest, taken on a line at right angles to the axis. On a Drunken Thread this is not so, and the crest of the thread is inclined to one side as shown at A. It must be remembered, however, that since this Helix Angle is variable a cross section of the same screw could be correct and normal if it were rotated through 90° about the axis. This is important when checking for Drunkenness on an optical comparator.

In order to get a Drunken Screw into a ring gage, the Pitch Diameter must be reduced by an amount depending upon the seriousness of the error. In the diagram it will be seen that the screw is rubbing on one flank only and that the Pitch Diameter has had to be reduced by an amount shown at B. It will be apparent that if this screw were to be increased to Basic Size it would not enter the GO ring. If a snap gage were to be used, the side float of the rolls, which is always present, would move over and accept the screw. This means that a snap gage will not control the effects of Drunkenness.

Figures 4 and 5 show the effects of Angle Error. A screw having Angle Error, either plus or minus can not enter a GO ring if it is up to Basic Size. Upon making a suitable reduction of the Pitch Diameter, the screw will enter.

Figure 6 illustrates that with Lead error the same remarks apply. Whether the error is plus or minus, there must be a reduction of the Pitch Diameter if the screw is to enter the GO ring.

Figures 7 and 8 illustrate one of the most important differences in the application of ring and snap gages. Threads produced by the rolling process are usually excellent on form, and can be held to close tolerances. One of the serious drawbacks is that the screw can be made out-of-round if not carefully controlled.

This out-of-round condition generally takes the form of 3-point lobing. A specimen of this is shown on the charts. It has the unique property of measuring the same at any point across the diameter, giving the false impression that it is round.

In the diagram, the internal diameter of the ring is the same as the gap in the snap gage. If the figure is rotated, the snap gage will accept it, but if the same figure is offered to a ring gage it would be properly rejected.

Results of Form Errors

Reviewing what has been discussed, it will be apparent that each error — form, drunkenness, or out-of-roundness—must be accompanied by a reduction of Pitch Diameter; the amount depending upon the seriousness of the error. Since these errors are always present, it also follows that the full Pitch Diameter as specified is not always available. It will also be apparent that the amount of these errors will bear a definite relation to the quality of the screw.

For example: If a screw will enter a GO ring gage snugly and the measured Pitch Diameter is of Basic Size, then it can be said that the screw is perfect.

Another screw may also enter the GO ring snugly, but its measured Pitch Diameter may be midway between Basic and the High and Low Limits. This would indicate an average condition present in most precision types of screws, and that the sum of all possible errors has only reduced the Pitch Diameter 50%.

However, if a screw were to fit tightly in a GO ring and the Pitch Diameter were down to the Low Limit, this would indicate the presence of a serious error or number of errors which should be investigated.

Method of Determining Pitch Diameter

From the above it will be seen that the determination of the Pitch Diameter is important, and that this measurement must be precise if argument is to be avoided. How is the measurement to be made? It has been done with pitch micrometers, roller indicating gages and even optically, but the fact remains that the basic principle of the 3-wire method is best.

Everybody connected with the manufacture of screw threads is familiar with this method, and the following illustration will show the effects of this method on the factors shown previously.

Figure 9 shows the effect of the wire method of measurement on the perfect thread form. Here the indicator shows that the Pitch Diameter is of Basic Size.

In Figure 10 the Drunken Thread is being measured on the Pitch Diameter and we note that half of the Pitch Diameter has been lost through the effects of this error.

Figure 11 shows Angle Plus, Error. Practically all of the tolerance has been lost through this particular error.

Figures 12 and 13 show the importance of allowing the wires freedom to align themselves in the screw threads. Figure 12 shows the measurement of the Pitch Diameter with the lower two wires held to the same position that they occupied when checking the perfect thread. In other words, they are spaced to the correct pitch. Since the thread shown has lead error, the wires, being fixed, only contact two flanks and do not settle in the vee. Note that in this condition the indicator points exactly on the Low Limit.

On Figure 13 the wires have been allowed to freely settle themselves in the threads so that they contact the flanks. Note that as a result the indicator now registers a lower position. This illustration is very important and should always be remembered when assessing the value of a NO GO gaging device.

Effects of Form Error on Tolerance

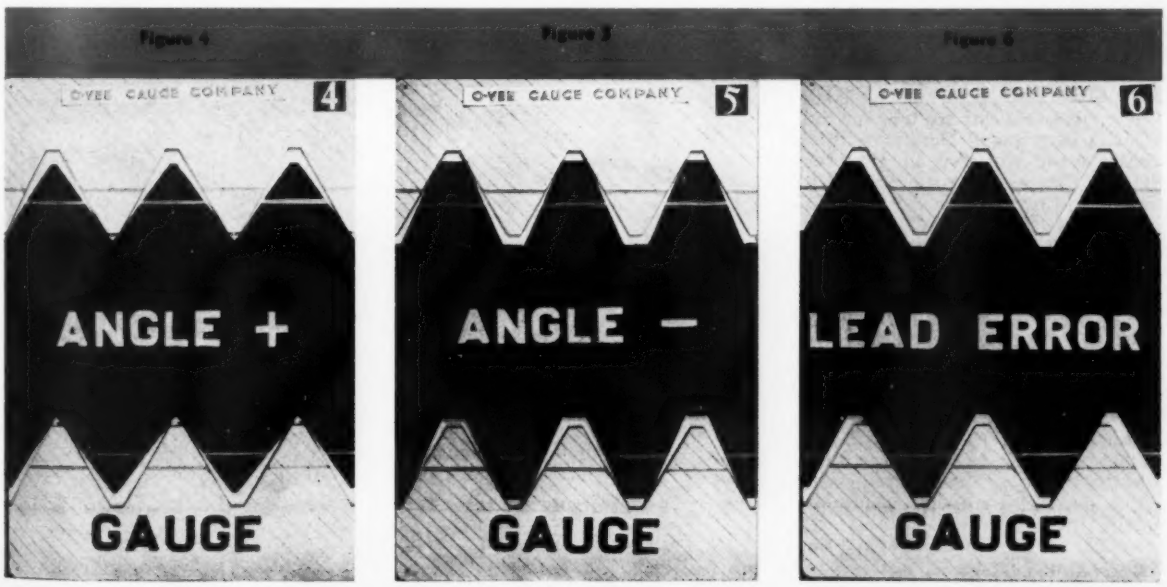
The next illustration, Figure 14, will come as a distinct shock to the average machinist who has long imagined that the tolerance as specified on the print is his allowance for making the screw. There are four examples shown, and the first (left) shows that the full Pitch Diameter tolerance is available for manufacturing only if the thread is perfect with no errors.

The second example shows an average condition where the Lead (L), Angle (A), Drunkenness (D), and out-of-roundness (O-R) have each taken ⅛ of the tolerance, leaving only half the Pitch Diameter tolerance available for manufacturing.

The third example shows the effect of an extremely bad setup where the same errors have taken up all of the tolerance and there is consequently no allowance for machining variation.

The last example shows an example of what may happen in the case of thread rolling. Here the form errors are very good, only absorbing about ⅕ of the tolerance. In this case however, the whole advantage has been lost due to a bad case of out-of-roundness.

Because of necessity the thread diagrams having been greatly exaggerated, some reference to actual values may not be out of place. The chart, Figure 15, will show that these variations in form are extremely small and only represent the variation of ONE element. When it is considered that errors in the thread elements are always present, the picture becomes somewhat depressing.



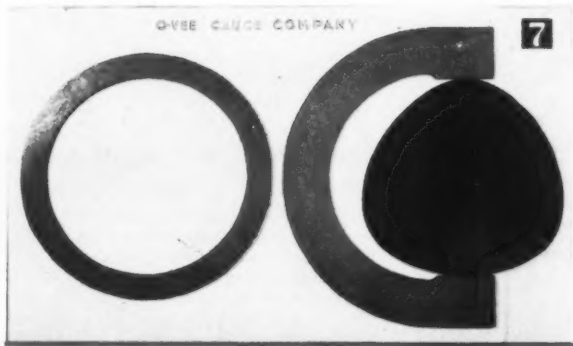


Figure 7

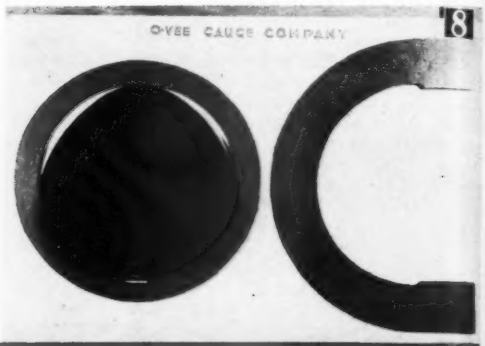


Figure 8

Conflicting Views on Screw Gages

It was mentioned earlier that the screw industry and certain sections of the automotive industry wished to retain the NO GO ring gage. Now that an appreciation of what is involved has been obtained, it may be in order to study why this attitude persists.

From the diagrams and text it is firmly established that it is virtually impossible to attain the Maximum Pitch Diameter by the use of commercial threading equipment. Errors in the form, etc. reduce the specified Pitch Diameter by an amount which can generally reach 50% of the specified tolerance.

Manufacturers claim that the Pitch Diameter Tolerance as specified includes the effects of Lead and Angle Errors at both the Maximum and the Minimum Metal Conditions. In other words, if the form errors claim 50% of the tolerance from the High Limit then they should reclaim it on the Low Limit gage.

By referring to Figures 3, 4, 5 and 6, it can be seen how this tolerance reduction can be reclaimed by the use of a NO GO ring gage. These show the effects of form errors on the GO ring gage and that the screws shown will be a snug fit in the GO ring, yet the Pitch Diameter is under Basic Size.

The same remarks are true for the NO GO ring gage. Screws with a similar error will feel snug in the NO GO ring and yet the Pitch Diameter will be undersized by a similar amount. For example, by using GO and NO GO ring gages, a screw could enter a GO ring gage, and not enter the NO GO ring. A check of Pitch Diameter may indicate that the errors in form have resulted in a loss of .002" of Pitch Diameter, therefore a screw which is undersized by this amount would be okayed by the NO GO ring by not going.

This reasoning on the part of the manufacturers is not bad, providing that the quality of the screwed product is good or excellent. Unfortunately, the worse the form is the more chance it has of obeying the NO GO ring.

Unscrupulous manufacturers have learned that it is extremely easy to get undersized parts accepted by NO GO rings by the simple expedient of squeezing the part out-of-round, bruising the first thread, or even placing the parts in a tumbler to create small bruises or burrs.

The NO GO snap gage does exercise a better control of these conditions for it is possible to check past the first thread and to check a certain amount of ovality which would be caused by deliberately squeezing the component out-of-round. This statement is not to be confused with the earlier statement that a 2-point check will not control out-of-roundness as shown in Figures 7 and 8. It is obvious that the snap gage will check out-of-roundness in an oval component while it may not check one which is lobed.

Efficient Gaging Methods Will End Confusion

The answer to this confusion is to specify efficient gaging methods which will ascertain the true condition of the thread and to specify a wider tolerance when permissible.

A customer may specify that his screws are to be of class 3 tolerance and that ring gages may be used. He will get the same quality screw or even better by specifying class 2 and the use of a GO ring and a Pitch Diameter check at the Low Limit. The price will probably be lower, too.

Terminology of the New Standard

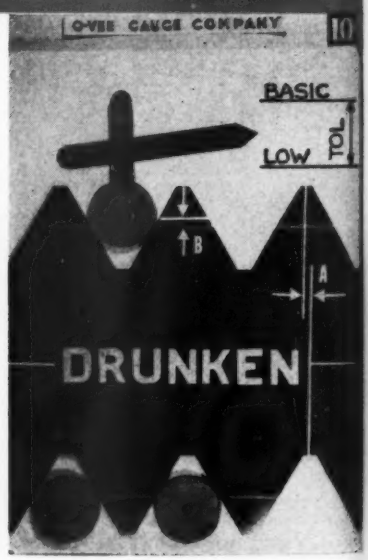
At this point a few remarks concerning the terminology of the standards will not be out of place.

In the first edition of H.28, the Pitch Diameter was referred to by just that term only. In the 1950 Supplement, the terms "Pitch Diameter (simple effective diameter)" and "Effective Size (or virtual effective diameter)" appeared. It is very necessary that these terms be understood, so here are the definitions taken from H.28 1950 Supplement:

Pitch Diameter (simple effective diameter): On a straight thread, the pitch diameter is the diameter of the imaginary co-axial cylinder, the sur-

Figure 9

Figure 10



face of which would pass through the thread profiles at such points as to make the width of the groove equal to one-half of the basic pitch. On a perfect thread this occurs at the point where the widths of the thread and groove are equal.

Effective Size (or virtual effective diameter): The effective size of an external or internal thread is the diameter derived by adding to the pitch diameter, in the case of an external thread, or subtracting from the pitch diameter, in the case of an internal thread, the cumulative effects of pitch and angle errors.

It should be pointed out that in the New Proposed Standard the last sentence has been modified thus: **". . . the cumulative effects of deviation from specified profile, including variation in lead, in uniformity of helix, in flank angle, taper and out-of-roundness and surface defects."** Note the addition.

By referring back to the illustrations, a better understanding of these terms may be obtained. Taking Figures 3, 4, and 5, the simple Pitch Diameter is the actual Pitch Diameter as measured by the wire method, which is the lower of the two pitch diameter lines shown on Figure 3. The Virtual Pitch Diameter is the actual pitch diameter, of a perfect form gage, which will contact the screw at the maximum condition. This is shown on Figure 3 as the upper of the two pitch lines, which happens to be, in this case, the pitch diameter of the gage, but it need not necessarily be so. In other words, the difference between Virtual and Simple Pitch Diameter is shown by dimension B on Figure 3.

Another clause in the proposed specification should be noted: **". . . the diameter equivalent of any one of the variables of lead, helix, thread angle, taper and out-of-roundness and surface defects may not exceed one half of the pitch diameter tolerance."**

Pitch Diameter Is of Paramount Importance

By now the reader will appreciate the fact that the measurement of the Pitch Diameter of a screw is of paramount importance. It is also true that the most accurate method of obtaining this measurement is by means of the "three wire method". Unfortunately this method is extremely slow and cumbersome and is usually reserved for the measurement of gages where accuracy is more important than speed.

The O-Vee Method

To meet the need for a rapid means of determining the pitch diameter of screw threads, the O-Vee gage and the O-Vee comparators were developed. The O-Vee gage is a simplification of the three-wire method and consists of a single wire, of the correct size to contact the pitch diameter, wound into a coil. This can be expanded by pressing one end, which serves as a lever, to admit the screw being checked. When the lever is released the O-Vee gage will grip the thread firmly, enabling the user to make the usual micrometer measurements "over the wires".

There is no complicated arithmetic necessary because the high and low limits are engraved on the data plate attached to the gage. All that is necessary is that the micrometer reading be between these limits. O-Vee gages are made in any of the regular classes of fit including the new Unified Standards and can also be supplied to special requirements.

For faster operation, the O-Vee comparator was developed. In this case the pitch diameter is checked by positioning the screw between a pair of helical coils of the correct size wire to suit the thread being measured. This instrument is supplied with a range of measuring coils to suit pitches of 8 TPI to 40 TPI. Each pair of coils is housed in a container marked as to thread pitch. Constants are printed on the container, enabling the user to set the instruments for any size screw by the use of standard gage blocks, thus eliminating costly setting plugs. This measuring instrument records the variation of the Pitch Diameter with rapid precision on the clear indicator scale equipped with tolerance pointers.

This is widely recognized as the fastest means of measuring pitch diameter and of correctly determining the low limit of screw threads. For this reason it is rapidly finding favor in many of the large plants for Receiving Inspection, quite apart from the obvious advantages to be obtained by its use in production.

Wire Method Observation

It must be remembered, however, that there are important considerations to be taken into account when using the wire method. It is possible to have a screw measuring the correct pitch diameter; but, if it has lead error, then the screw will not assemble. For this reason, the GO ring gage can not be entirely eliminated, but its use and consequent wear can be reduced by the following simple procedure.

It has been established that the effects of lead and angle errors have the effect of reducing the Simple Pitch Diameter. Any inspection of screw threads should start with investigation of the actual reduction that has taken place. When this amount is known the inspector can judge the quality of the screw thread

Figure 11

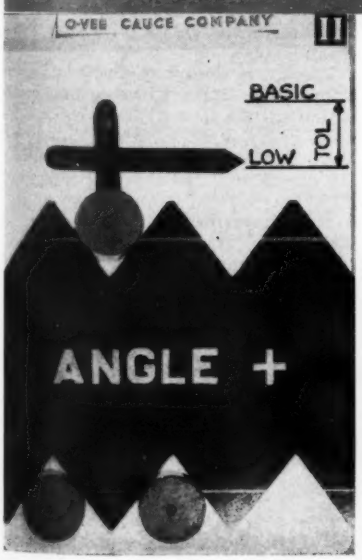


Figure 12

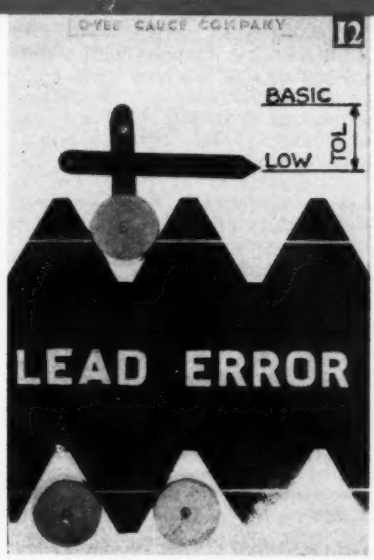


Figure 13

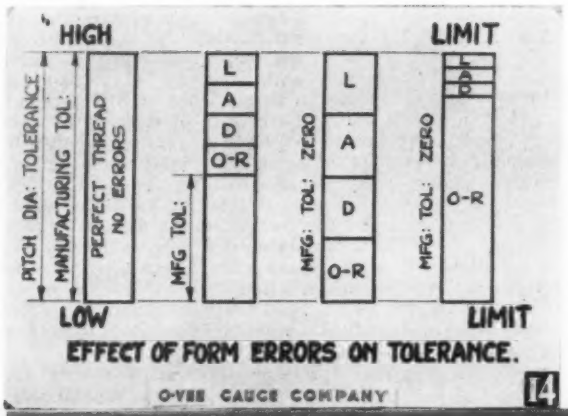


Figure 14

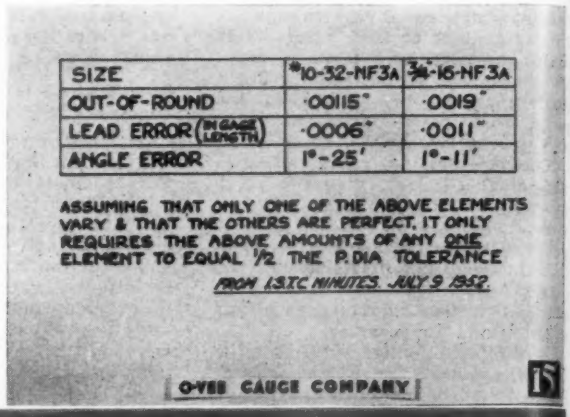


Figure 15

and determine at what particular Pitch Diameter he should make a GO ring check.

For example: A screw should be selected which is a snug fit in the GO ring gage with the pitch diameter measured by inserting the screw between the measuring coils of the O-Vee comparator. It follows that if the measured Pitch Diameter is up to Basic then there is no reduction due to the effects of form errors, etc. The screw form can then be pronounced Perfect and the remainder of the batch can be checked by pitch diameter measurement only.

It is more likely that the screw will measure at least one fourth of the tolerance down from the Maximum Pitch Diameter, so it can be assumed for this example that if the Pitch Diameter tolerance is .0060" then the reduction may be .0015". Any screws having an indicated Pitch Diameter of more than .0015" from the maximum pitch diameter can then be passed by the pitch diameter measurement only. If, however, the measured pitch diameter should approach or be less than .0015" then the GO ring gage should be applied to make certain that the screw will enter.

Generally a good quality screw will enter a GO ring gage if the measured pitch diameter is within the LOWER half of the pitch diameter tolerance, but it is essential to make the check mentioned above to ensure that it is of reasonable quality.

end

Cross Starts Training Its Own Designers

The Cross Company has taken action to help relieve the plaguing shortage of engineering personnel. The Detroit firm has organized its own engineering school to train machine designers for its expanding automation machinery and special machine tool building operations.

One of the first of its kind in the machine tool building industry, the Cross program includes a 26-week concentrated learning period and then 3½ years of on-the-job training. Upon completion of the schooling the men will qualify as machine draftsmen.

"It's not a substitute for an engineering degree," emphasizes Executive Vice President Ralph E. Cross, "and all trainees will be urged to complete their formal engineering schooling at night, following the first six months period."

Kurt Tech, Cross vice president in charge of engineering, and Joseph E. Cohen, supervisor of the training program, are to direct the 26-week concentrated program for the course's eight students before assigning them to project managers for the on-the-job training.

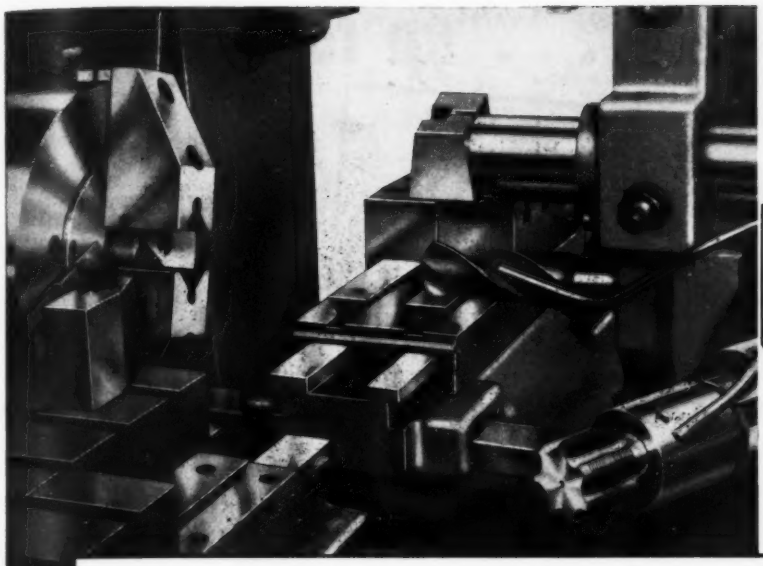
Training is to include sessions to familiarize the students with standard and special machine tools, engineering fundamentals, and drafting techniques. Emphasis is being placed on working habits, dress, and personal conduct in business.

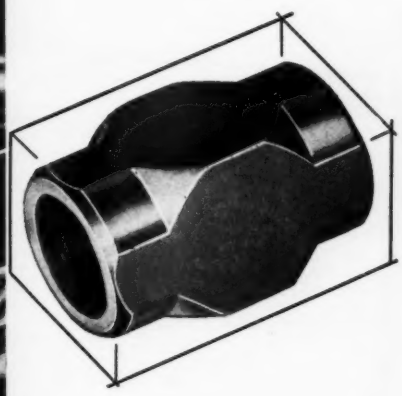
All aspects of the course are focused on what the young engineer should know and do to get ahead in the business world.

The trainees, high school graduates whose selection tests indicate an aptitude for becoming designers of the machinery Cross builds, are to be paid during the entire four-year program.

The Cross Company also conducts a three-year apprenticeship program which enrolls four high school graduates every three months. This program incorporates a five-day on-the-job course and Saturday attendance at Wilbur Wright Technical Institute in Detroit for formal training. Members of this program become journeymen machinists.

First class in the Cross school study a plant layout, as explained by Kurt Tech (left), engineering vice president, and Joseph H. Cohen, program supervisor (right), who direct the concentrated study program.





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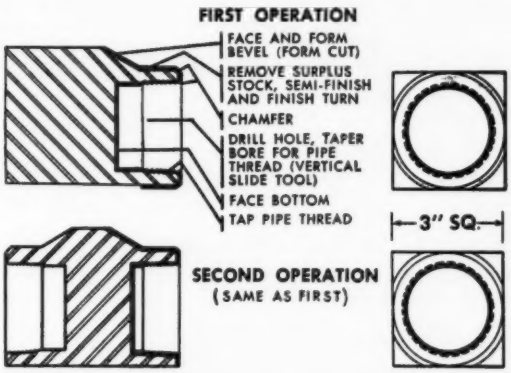

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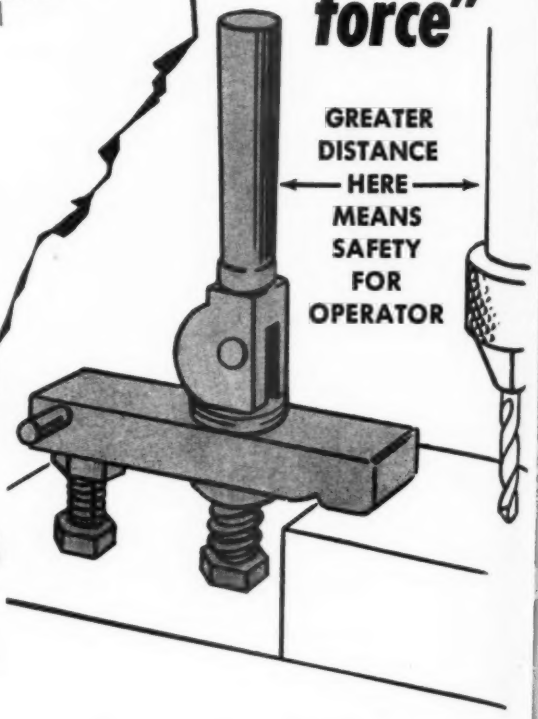

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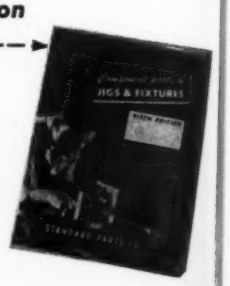

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A3	A21	A39	A57	B4	B22	B40	B58	B76	C2	E8
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CLEVELAND 18, OHIO

FIRST CLASS
PERMIT No. 7879
CLEVELAND, O.

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TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO

Hollow Mill Maker finds

DBL-2
High Speed Steel

HARD, TOUGH and VERSATILE

The maker of these adjustable hollow mills required a steel that would give top performance in a variety of jobs—turning, tapering, facing, chamfering and trepanning. After thorough testing, Ludlum's high speed DBL-2 was selected.

DBL-2 is an improved general-purpose high speed steel. It contains tungsten, molybdenum and vanadium in such proportions that it excels 18-4-1 for most applications. DBL-2's unusual combination of high hardness with toughness, its ability to hold a fine grain over a wide hardening range, and the fact that it easily machines many diverse types of stock, made it particularly well suited for this job.

In addition to these advantages, DBL-2 can be heat treated in the same furnaces and atmospheres as 18-4-1 without fear of harmful decarburization. These DBL-2 blades were heated to 2250 F, oil quenched and drawn twice at 1025 F. After heat treatment, blades easily machined such stock as aluminum, stainless steel, carbon steel, aircraft steel, plastics, bronze, screw stock, cast iron and brass.

There is an A-L tool steel to meet your toughest requirements. Call your A-L representative or distributor today . . . or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*

Write For Copy of
"CUTTING TOOL MATERIALS"
This 36-page illustrated booklet analyzes and compares types and covers grade selection for all major classes of cutting tools, etc., invaluable data for production men. Write for your copy today.
ADDRESS DEPT. TP-81

For complete **MODERN** Tooling, call

Allegheny Ludlum

W&D 5350

AL® FINE TOOL STEELS SINCE 1854

CIRCLE INFORM-A-GRAM KEY NO. 99

New

New Cincinnati
Rigid Shapers

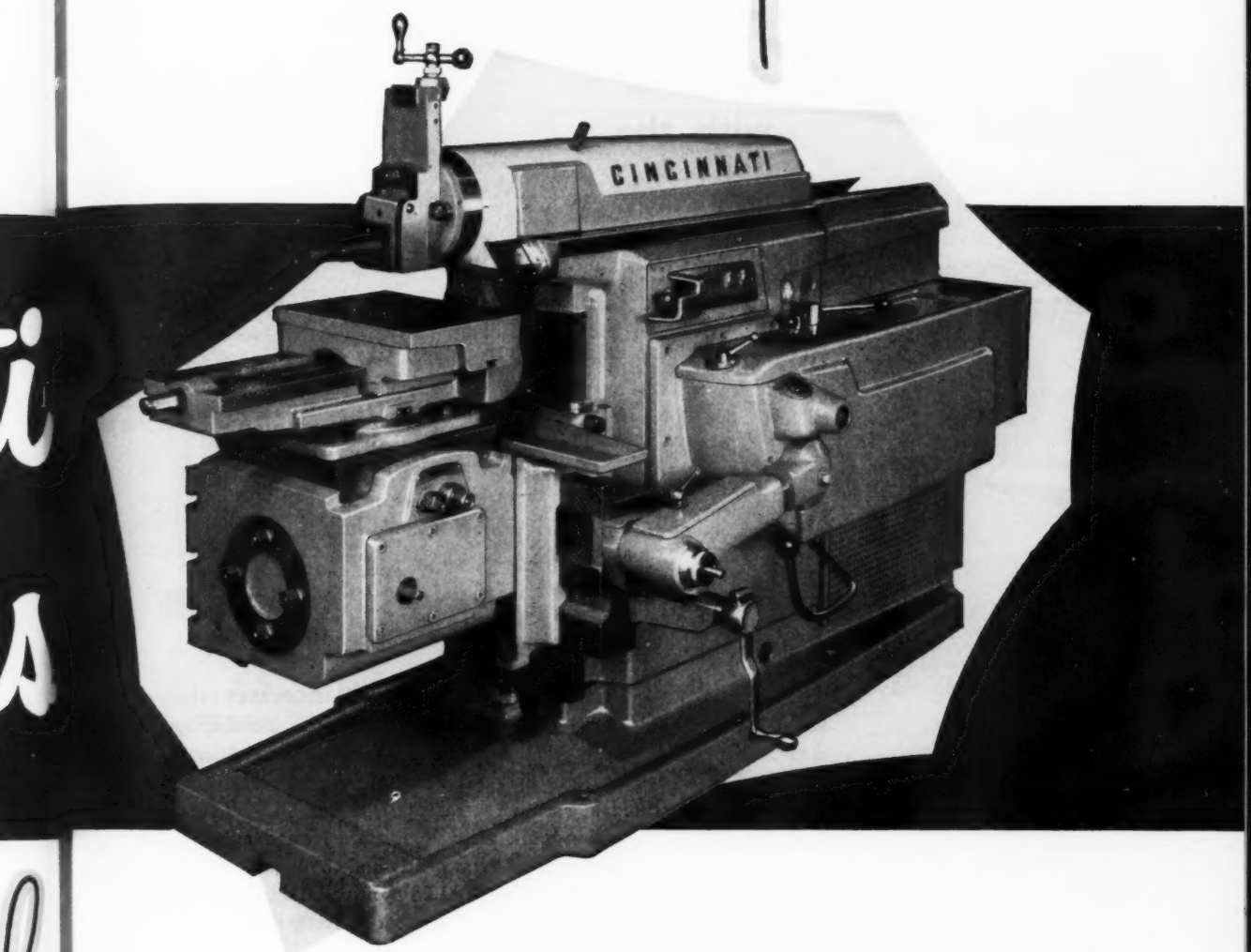
New Look.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Accuracy . . .



Very rigid and powerful—the New Cincinnati Rigid Shapers give a new accuracy—on heavy cuts and light cuts. They have the most rigid column and ram in shaper history. The Electro-magnetic clutch and brake and 50 PSI positive lubrication are exclusive features that give continued, efficient and accurate performance.

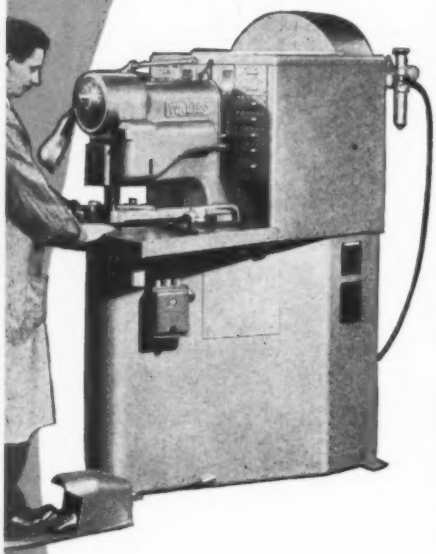
Write for bulletin on these new Cincinnati Rigid Shapers.

CIRCLE INFORM-A-GRAM KEY NO. 101

"WALES-WAY" showed us how to SPEED-UP hole punching OVER 50% ...

with the

WALES FABRICATOR

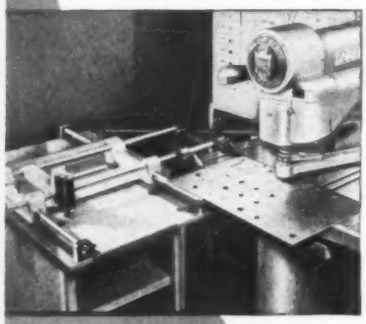


Here's a big money maker in any sheet metal shop. Punches and dies for round and shaped holes take only seconds to remove and replace. Complete sets are always ready in handy cabinet. For holes up to 3½" diameter the "WALES-WAY" quick change method saves plenty of time on your job. The WALES FABRICATOR is the PRACTICAL single-hole punching equipment with plenty of reserve power for punching up to ¼" plate.

Immediate deliveries, you may pay for the equipment out of profits if you wish. Let us tell you about this plan.

The NEW positive DUPLICATOR

This husky WALES DUPLICATOR increases the scope of your WALES FABRICATOR to make production runs both practical and profitable. It permits positive duplication of unlimited hole patterns from master templets to jig borer tolerances. The templet is secured in steel work table T slots of DUPLICATOR. Cam action clamps position work piece. Holes are located quickly and easily by a stylus type locater pin. Press gently and the hole is duplicated EXACTLY on the work piece. The WALES positive DUPLICATOR does a terrific job. Any man in your shop can handle it perfectly in a few minutes.



Send For Bulletin No. IIH

Get the complete story of the WALES Sheet Metal FABRICATOR with proof of performance. The facts about the positive DUPLICATOR are included. This is the type of equipment that merits your consideration NOW.

See the NEW WALES MOBILE FIELD UNIT

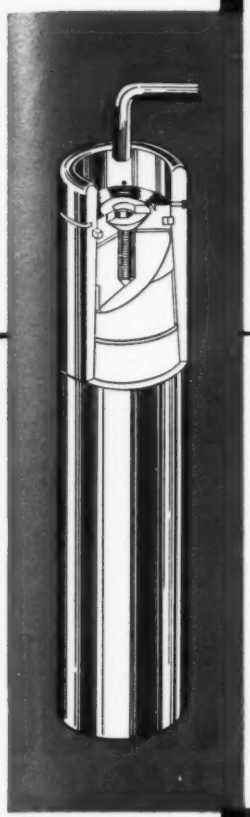
Outfitted with Fabricator, Duplicator, Tooling and equipment to show you, right at your door, the money making potential of the "WALES-WAY". Let us arrange for the Field Unit to visit YOU.

WALES Strippit COMPANY

"...the Wales-Way is the PLUS-PROFIT way"

345 PAYNE AVE. — North Tonawanda, N.Y.

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.



One Man Removes Large Punch Holder in 3 Minutes!

with SUPERIOR

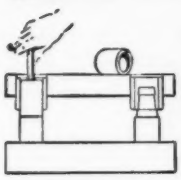
REMOVABLE CAP GUIDE PINS

End Troublesome Binding in Die Set Assembly

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes.

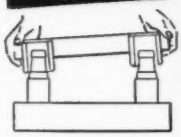
NOW OFFERED IN PIN DIAMETERS OF 1¼" UPWARD, AS STANDARD EQUIPMENT ON ALL SUPERIOR DIE SETS. SPECIFY IF DESIRED. WRITE FOR COMPLETE FREE INFORMATION.

FAST



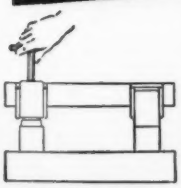
REMOVING CAP

SAFE

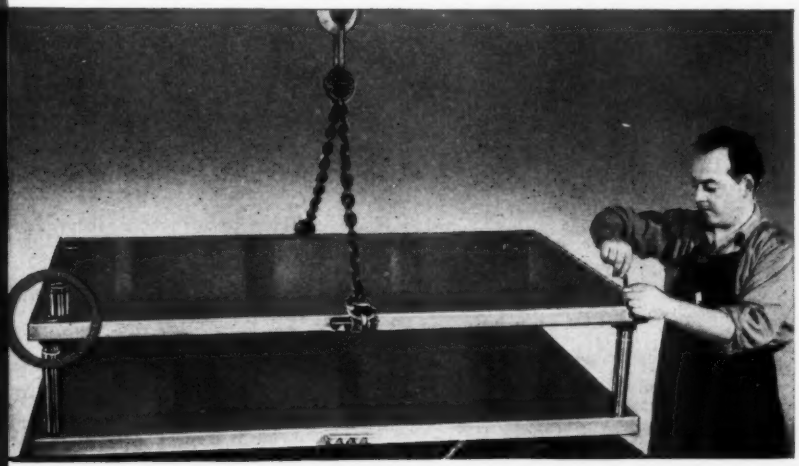


PARTING DIE SET

ACCURATE



REPLACING PUNCH HOLDER



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SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS

CIRCLE INFORM-A-GRAM KEY NO. 103

Choice of hand or
power feed head and table

BALANCED RIGIDITY

assures
*CERTIFIED
ACCURACY

in the NEW

U.S.Vertical
MILLING MACHINE

Balanced rigidity, the key to accuracy for vertical and angular milling operations, is an integral part of the new U. S. Vertical Milling Machine.

These U. S. Vertical features provide rigidity for close tolerance work:

- Machine weighs 2000 pounds
- Extra wide bearing surfaces
- Motor mounted behind column, balances weight of head, resists vibration and deflection
- Major castings are internally ribbed, normalized, stress relieved, and internally braced
- Dovetails are deep and hand scraped
- Massive knee, saddle and table

Drive by B section V belt

***Tested 10 Ways!**

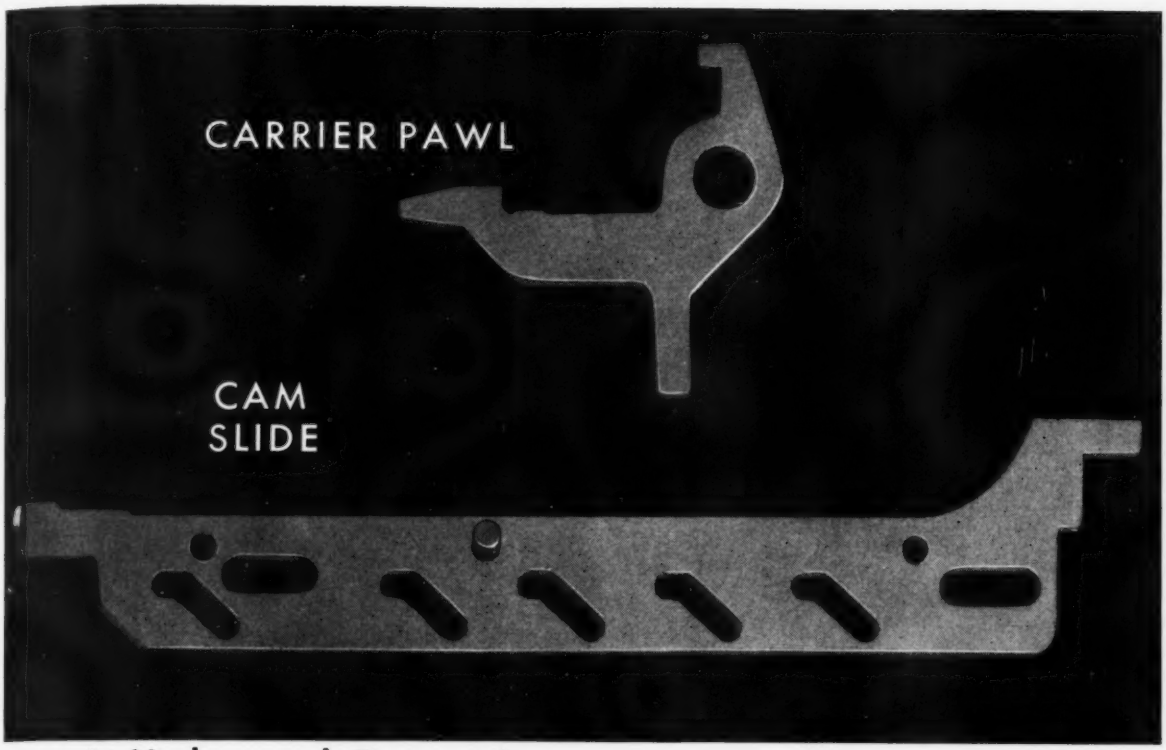
The accuracy of each U. S. Vertical Milling Machine is certified. A check sheet accompanies every machine listing 10 exacting operational tests the machine has passed. The check shows allowable tolerances and actual measured tolerances of the individual unit. A new bulletin provides complete specifications and illustrates various accessories available on the new U. S. Vertical Milling Machine. Write for your *FREE* copy today.

U★S★Burke
MACHINE TOOL DIVISION

7 Brotherton Road
Cincinnati 27, Ohio

Manufacturers of:
Burke Bench Mills, U. S. No. 1 Milling Machine and the radically new U. S. Quartet

CIRCLE INFORM-A-GRAM KEY NO. 104



At Underwood Corporation . . .

HONITE Method Saves $11,750 On Finishing Precision Stampings

The Underwood Corporation, Bridgeport, Conn., puts 1000 *different* precision-made parts into their standard adding machine. Recently this company switched to the Honite barrel finishing method . . . and look at some typical results!

CARRIER PAWL About 1,000,000 of these cold-rolled steel parts are made each year. By the old combination of hand-finishing and tumbling methods, it required 15 separate operations to make each pawl — from blank to finish-plated. With the Honite Method, the *total* number of steps has been cut to 6 — with an annual saving on this part alone of $11,750!

CAM SLIDE The sides of this cold-rolled steel part must be exceedingly smooth because they are in direct contact with other surfaces, and tolerances must be held to .002" - .003". The old hand-honing method required 3900 man-hours per year to produce these parts. The Honite barrel finishing method has cut the total annual man-hours to 500!

The average overall cost for finishing parts by the old method varied from $.70 to $1.10 per 100 pieces. With the Honite barrel finishing method costs were cut to an average of $.10 per 100 pieces — a 91% saving. The company's investment in Honite barrel finishing equipment was thus paid off in *less than a year!*

You, too, can cut costs with the Honite barrel finishing method. Send coupon today for full facts.

Honite BRAND

PRODUCT OF 3M RESEARCH

Made in U.S.A. by
MINNESOTA MINING AND MFG. CO.
General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City.

3M COMPANY

MINNESOTA MINING AND MANUFACTURING CO.
Dept. MH-96, St. Paul 6, Minn.

☐ *Send me free copy of "Facts and Figures Report on Honite Barrel Finishing."*

☐ *I'd like to talk to a Honite Sales Engineer.*

NAME _____ TITLE _____

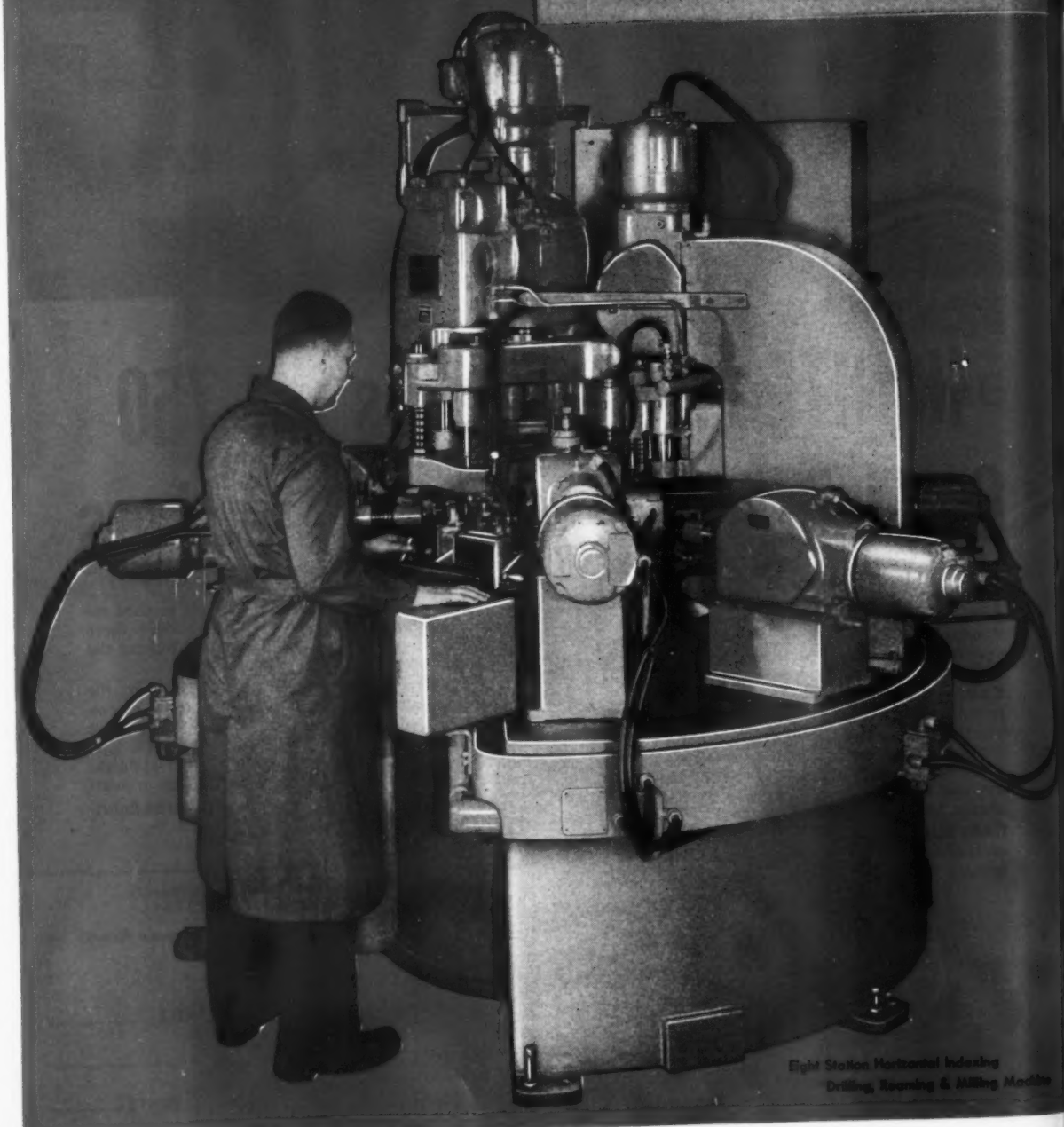
COMPANY _____

CITY _____ ZONE ____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 105

HARTFORD *Special*

OFFERS
better products
at lower cost
thru better methods

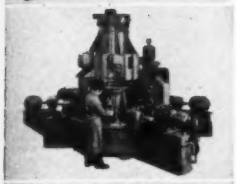


Eight Station Horizontal Indexing
Drilling, Reaming & Milling Machine

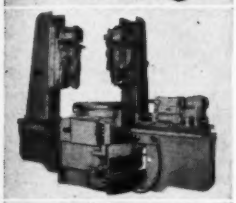
ONE SOURCE FOR BOTH

Automatic Production Machines

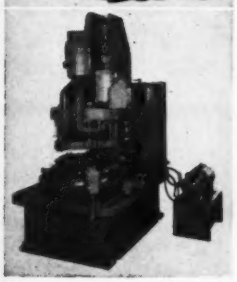
Double End Trunnion Type Machine



Center Column Indexing Type Machine

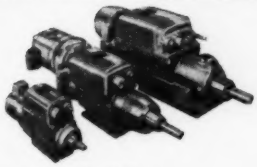


Universal Drilling Machine for jet aircraft components



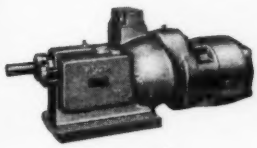
Vertical Single Unit Multiple Spindle Indexing Machine

Standard Machine Components

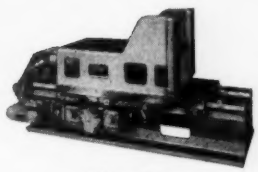


Quill Type Air Hydraulic Drill Units

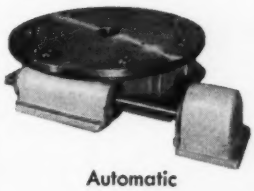
Quill Type Cam Units



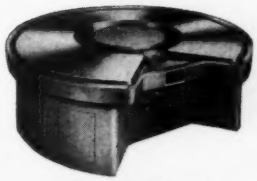
Quill Type Lead Screw Tapping Units



Way Type Hydraulic Feed Units



Automatic Index Tables Horizontal and Vertical



Machine Bases

Designing and building automatic production machines like those illustrated are a "Hartford" specialty. Years of experience have proven that dependable high production and economy can best be brought to the user by means of standard machine components.

Now Hartford Special offers these production tested components to users for machines of their own construction.

Consult Hartford engineers for either—completely tooled machines or components.

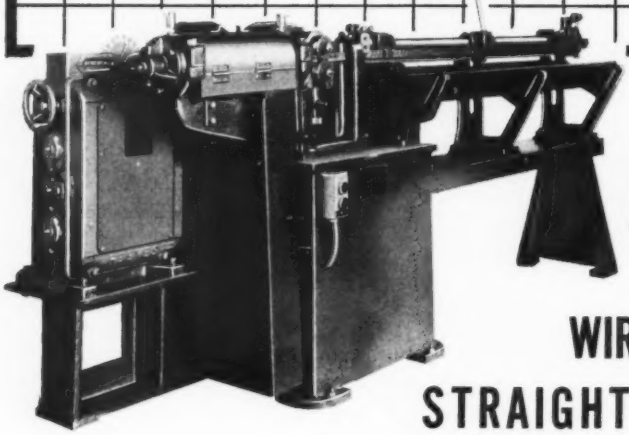
HARTFORD Special

MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
2929 HOMESTEAD AVE., HARTFORD 12, CONN.

Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.

CIRCLE INFORM-A-GRAM KEY NO. 107

NEW! SHUSTER LIGHTNING CUT-OFF PRODUCTION BOOSTER



1AV

WIRE STRAIGHTENING AND CUTTING MACHINE

DESIGN ADVANTAGES

Micro-switch target and clutch

Lightning cut-off

Hardened steel cut-off knife delivers square, true, undistorted ends.

Direct-drive five-die straightening flier

Ball and roller bearings throughout

Other infinite variable speed machines for diameters up to 11/16" are available. Send for literature.

NOW EQUIPPED WITH ELECTRICALLY CONTROLLED TARGET AND CLUTCH!

Variable Speed — the speed you want when you want it. Geared to feed 50 to 200 feet per minute.

Constant Speed when set, regardless of load variations!

Infinite feed changes and control!

Minimum maintenance — frees operator from worry!

Straightens and cuts 3/32" to 1/4" **or** 1/16" to 3/16" diameter basic wire — real production flexibility!

Most economical machine of its kind! — both in original cost and maintenance!

Send for Bulletin No. 53

METTLER MACHINE TOOL, INC.

150 Adeline St. **New Haven, Conn.**

CIRCLE INFORM-A-GRAM KEY NO. 108

At Your SERVICE

Quality forgings of non-ferrous alloys — aluminum, copper and brass — are specialties of Revere Copper & Brass' Rome Manufacturing Co. Division in Rome, N. Y. The plant has all the facilities for performing every operation, from die designing to heat treating.

Engineers at MacDermid, Inc. of Waterbury, Conn., utilize the latest finishing techniques and materials to duplicate under rigid control in their customer service laboratory the processing cycle of virtually any metal finishing plant. This helps analyze and solve metal cleaning, plating and finishing problems before the more costly production stage.

Aircraft components, screw machine parts, cold headed products and all types of precision hardware for industrial applications are offered under contract by Aero Supply Mfg. Co., Inc., of Corry, Pa.

Worcester Pressed Steel Company has added to its facilities a 400-ton blanking, forming and multiple operations press of a type rarely used outside the auto industry. The giant was built to Worcester specifications to provide the greatest possible stamping versatility, and should prove especially useful for contract stamping work. The press has a bed area for inserting dies up to 42" wide and 7' long; it is equipped to blank large sheets of metal at the rate of 1,200 strokes per hr.

NECROLOGY

Philip Arnold, 73, retired vice president of The Garlock Packing Company, Palmyra, N. Y., died July 3 in Carmel, Calif.

William Bradford Peirce, 78, retired vice president of Research and Development for the Flannery Bolt Co. of Bridgeville, Pa., and past president of the American Society of Tool Engineers, died in Pittsburgh, following a heart attack on July 4.

R. E. Christie, vice president of Crucible Steel Company of America, died suddenly on June 27 at New Rochelle, N. Y.

Ancil H. Bishop, 65, vice president of U. S. Industries, Inc., died in July in New York City after a long illness.

Walter O. Larson, president of the W. O. Larson Foundry Co., Grafton, Ohio, died July 28 from injuries received in an automobile accident on the Ohio Turnpike.

Kendex Holders in the new small size (illustrated) have ½" square by 4½" long shanks. They take ⅜" square or ¼" (inscribed circle) triangular inserts.

NOW, small Kendex* Button Tools with turnover "throw-away" inserts

...for light machining on high production operations
...especially useful for boring operations

Another variation of the popular Kendex Tooling is now available. This is the new ½" Kendex Holder, available in four styles, for use with triangular or square Kennametal* "turn-over" button inserts . . . making available small tools with the many advantages and economies of the Kendex principle:

- grinding is eliminated
- inserts are indexed quickly to each new cutting edge
- machine downtime is reduced to a minimum
- production is increased

If you are interested in small-sized, rugged, dependable clamped-type tooling, ask your Kennametal tool engineer to show you how these small Kendex holders can be used to advantage on your operations. Or write for Booklet 301. KENNAMETAL INC., Latrobe, Pennsylvania.

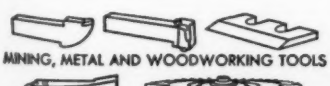
Small-sized Kendex Tools are equipped with Kennametal chip breakers and solid Kennametal seats to back up inserts.

Kennametal inserts for small Kendex holders are stocked in a number of grades including the new K7H grade for high velocity operations and for machining heat-treated or high tensile steels.

Tell us your small-tool problem and our tool engineers will help you select the right tool and grade of cutting edge.

*Registered Trademark

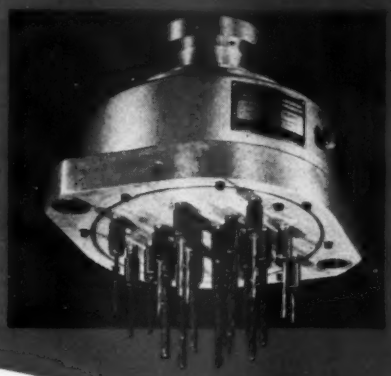
B-5978



INDUSTRY AND KENNAMETAL ...Partners in Progress

CIRCLE INFORM-A-GRAM KEY NO. 109

MAKE ZAGAR your HOLE CENTER FOR DRILLING, REAMING AND TAPPING . . . . . .

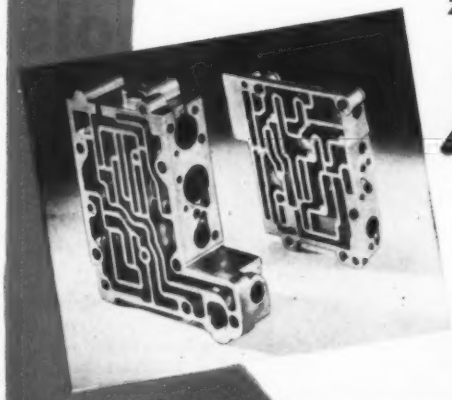


Any hole pattern — on any center up to 1½" dia.

Zagar's Broad-Scope Engineering SOLVES ANY HOLE PROBLEM

Zagar meets every drilling problem with the most effective, low cost equipment: gearless drill heads, standard drilling machines, special drilling machines, and index, trunnion or pallet-type multi-station transfer machines. We can furnish the complete tooling if you desire. Perhaps Zagar drill heads can be installed profitably on your own drill press. Send us a drawing of the part you are planning to drill. Or, let us study your present situation with a view to reducing your drilling cost.

ZAGAR, INC., 23894 Lakeland Blvd., Cleveland 23, Ohio

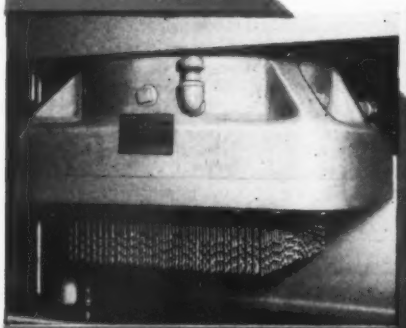


Any machinable material — from all angles.

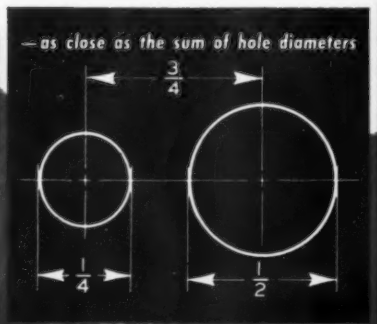
Zagar

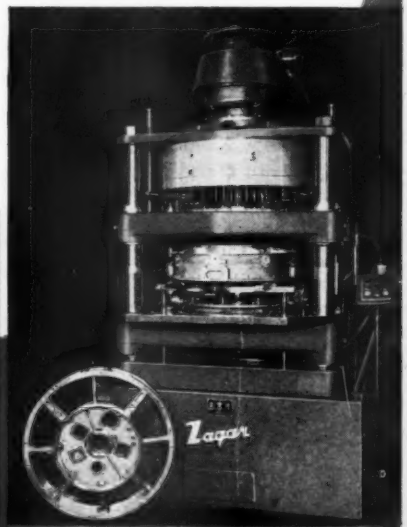
Write for Engineering Manual T-9

TOOLS FOR INDUSTRY and SPECIAL MACHINERY



Up to 1000 holes can be drilled IN ONE PASS.





4-post ram-type drilling machine for aircraft parts.

CIRCLE INFORM-A-GRAM KEY NO. 110

Guarantee
OF HIGHEST QUALITY
To ensure satisfactory performance, Parker-Kalon Fastening Devices are made to exacting specifications covering dimensional and physical characteristics which are checked at every stage of manufacture, and passed upon by Parker-Kalon's Quality-Control laboratory. Should this product prove faulty in any way, replacement will be made without charge.
PARKER-KALON DIVISION
GENERAL AMERICAN TRANSPORTATION CORPORATION
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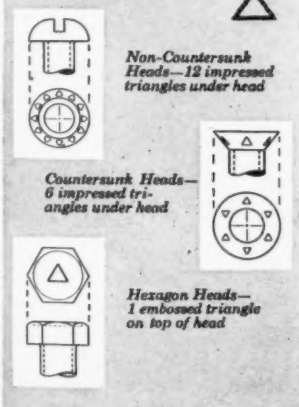
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Hexagon Heads—1 embossed triangle on top of head

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PARKER-KALON® fasteners

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CIRCLE INFORM-A-GRAM KEY NO. 111

SHOP AIDS

A New Method of Pricing Bay State Products is found in a pricing book released by Bay State Abrasive Products Co., Westboro, Mass. The book replaces all previous and current pricing materials except the catalogs, "Bay State Diamond

Wheels" and "Abrasive Products for the Building Trade." Included are sections on grinding wheels and segments, mounted wheels and points, and oilstones. The pricing book is made available by the company, or — **Circle Inform-A-Gram No. C1.**

A Quick Explanation of Unified Screw Threads, in simple language, is found in a 4-page illustrated folder. Cited are the profile origins of the Unified Threads adopted in 1948 by United States, Britain and Canada; minor changes in threads/in from American Standards; advantages of thread tightness and interchangeability. For a copy of the folder, "What's All This about Unified Threads?", contact The Cleveland Cap Screw Co., Box 600, 2917 E. 79th St., Cleveland 4, or — **Circle No. C2.**

"We're Up To Our Neck in Good Shopkeeping" discusses "Monday morning odor," and the elimination of sludge in a machine, smoke and oily floors and the nuisance of dermititis. The booklet which presents the material in cartoon style, is written from the shop man's point-of-view. It outlines a program that has resulted in healthier working conditions, cleaner machines and increased production efficiency. Obtain copies of the booklet from F. E. Anderson Oil Co., Portland, Conn., or — **Circle Inform-A-Gram No. C3.**

Barrel Finishing Methods and Materials are described in the folder, "Precision Barrel Finishing," published by Oakite Products, Inc., 157 Rector St., New York 6. The subject is discussed from pre-cleaning to final rinse, applying information gained from actual in-shop experience. Also covered are the barrel finishing materials recommended for the various procedures. The folder gives an over-all view of the problems and requirements inherent in the barrel finishing method. **Circle Inform-A-Gram No. C4.**

List of American Standards — Spring 1956. Sixteen hundred American Standards are indexed in this publication from American Standards Association. There are 152 standards for mechanical engineering, including screw threads, small tools and machine tool elements, bolts and nuts, pipe flanges and

flanged fittings, etc. The 56-page booklet also describes the work of the Association and gives information on how to purchase both American Standards (with quantity discounts) and those from other countries. In addition, organizations which sell American Standards in 43 other countries are listed. **Circle Inform-A-Gram No. C5.**

Procedures in adapting any standard grinder for use with the Anocut process are outlined in an engineering bulletin. Included are cutaways, exploded views and parts recommendations. Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6, will provide copies of Engineering Bulletin 300, or — **Circle No. C6.**

A Pocket-Size Manual contains suggestions for operating and maintaining Nelco tools. Discussed are speeds and feeds, operation of end mills, resharpening of Nelco tools and correct grinding procedure for carbide milling cutters. Also included are formulas, a table of recommended cutter speed and chip load, a cutting speed conversion table and tables giving rake and clearance angles. Copies of the manual are made available by Nelco Tool Co., Inc., Manchester, Conn., or — **Circle Inform-A-Gram No. C7.**

A Tool Selector Chart is made available by Vascoloy-Ramet Corp., Waukegan, Ill. It covers carbide and Tantung tools, carbide inserts, and V-R toolholders with "throw-away" blanks. The carbide grade chart gives the grades for steel, and cast iron, non-ferrous metals and non-metallics. The Tantung grades are given on another table. On the reverse side is a surface speed table for the general H.S. steel, Tantung and carbide cutting ranges. **Circle Inform-A-Gram No. C8.**

A Hydraulic Hose Selector is being offered by the Wiretex Hose Dept., Republic Rubber Div'n, Lee Rubber & Tire Corp., Youngstown 1, O. The revised selector contains the latest S.A.E. and industry specifications on rubber covered hydraulic hose. Start-

ing with any known factor such as I.D., O.D., minimum burst, working pressure required or bend radius, the proper Wiretex rubber covered hydraulic control hose can be determined for a particular need. **Circle Inform-A-Gram No. C9.**

Talking About Die Sets

with
Phil Marsilius
Vice-President
The Producto Machine Co.

Master or Commercial: What Makes the Difference? The most obvious difference between a Master (Precision) set and a Commercial set is the price. The Commercial set costs less because less assembly time is required in its manufacture. Punch holder and die holder tolerances are the same for both grades of die set. However, extremely close tolerances for fit between pins and bushings on Master sets require more accurate honing of bushings in assembly. Master die set tolerances for parallelism between punch and die holder are also more critical than those for Commercial die sets.

Normally, the difference between pin and bushing diameters on die sets manufactured by our industry is never less than .0002" and ranges as high as .0009". There are die sets made to closer or looser tolerances than these, but generally speaking, the majority of die sets fall into this category.

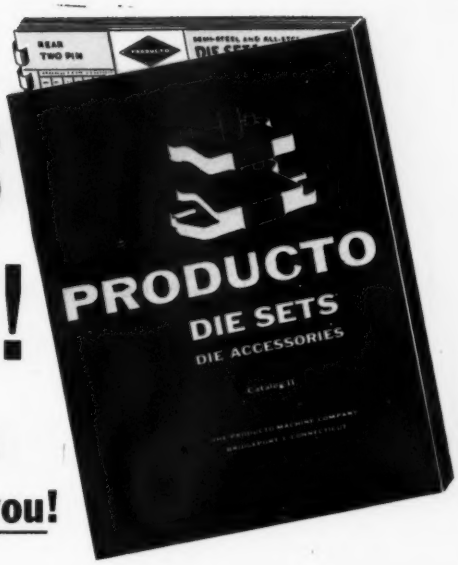
Master die sets are manufactured to the low side of this tolerance scale and are held to a maximum of .0004" differential. This closer tolerance increases the useful life of precision sets by allowing for wearing of the pins and bushings in operation.

Commercial die sets are made throughout the entire range of this tolerance scale and, more often than not (to reduce assembly cost), are made to the higher tolerances. As a result, their accuracy will usually decrease much faster than that of Master die sets. While it is possible with this tolerance range to receive a Commercial set with the minimum pin and bushing fit allowed, you can be certain of longer die set accuracy only with a Master set, which is guaranteed to be held to the low side.

A "free-sliding fit" is one that permits the punch holder to move down on the guide pins of its own weight. It does not have any bearing on the degree of accuracy of the die set since a free-sliding fit can be supplied on both Master and Commercial sets. On Master sets, however, it is sometimes necessary to hone out the bushings to a full .0004" tolerance to provide a free-sliding fit.

EVERY die set MUST, of necessity, work freely in normal use, *on the press,* but catalog die sets should come apart and go together easily for bench work. With an occasional exception (when sets are made to the lowest tolerance for fit allowed), disassembly should be possible by hand without use of separating tools.

In making a choice, the degree of accuracy required and the life requirements of the die set should be the main points of consideration which determine whether you should order a Master or Commercial die set.



IT'S HERE!

A new catalog designed for you!

WRITE FOR YOUR COPY TODAY

Here, at last, is a die set catalog that makes your selection and ordering really easy. Producto's all-new catalog is compact for the die designer, convenient for the purchasing agent, a functional tool for the die maker.

These unique features make Producto's catalog much easier for you to use:

IT'S COMPACT. Though many items have been added, it has *fewer* pages because superfluous material has been eliminated. New products include Qwik-Fit Guide Pins, new Bushings with grease fittings, Lamina Bushings, Ring Punches and Dies, Toolroom Equipment, Lubrication Accessories and new Die Spring Selections.

IT'S COMPLETE, containing the greatest selection of die sets and accessories that has ever been offered to date.

ALL PRICES ARE NET and appear in a *separate pricing supplement,* removed from the technical section. No more time-consuming "discount" calculations.

NEW BINDING ARRANGEMENT lets you look at technical and pricing information *simultaneously.* No more flipping pages back and forth to get complete information.

STREAMLINED PAGE LAYOUT makes it easier for you to find essential data. Color highlights catalog numbers and drawings.

To make your die set ordering as painless as possible, write today for a free copy of Producto's new Catalog No. 11.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

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POP SURE TOLE MERTON OFF WHEN HE CAUGHT 'IM CHUCKIN' FILES INTO TH' TOOLBOX
POP SAYS THAT GOOD FILES DESERVE GOOD CARE, SO OUR MERTON'S BEIN' EXTRA CAREFUL NOW!

Nicholson and Black Diamond files are fine hand tools from a manufacturer who specializes in files and files alone. In steels made to exacting specifications, in blanks checked for exact conformity to a master blank, in precisely cut teeth that are given an extra-keen edge by sandblasting—in dozens of painstaking manufacturing steps and unremitting quality controls, you are assured that there are no finer files than those made by Nicholson.

An X.F. (*E*xtra *F*ine) Swiss Pattern file is shown here. It is one of hundreds of Swiss Pattern types and sizes. In addition there are literally thousands of cuts, sizes and shapes of Regular and Special Purpose Nicholson and Black Diamond files. These fine tools needn't be treated with the exaggerated care shown by Merton in the cartoon. But they'll cut faster and last longer if you keep them clean and in a file rack. As Pop says, good files deserve good care.

NICHOLSON U.S.A. **NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND** BLACK DIAMOND U.S.A.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON and BLACK DIAMOND FILES

A FILE FOR EVERY PURPOSE

CIRCLE INFORM-A-GRAM KEY NO. 114

BOOK REVIEWS

FIBER GLASS AUTO BODY CONSTRUCTION SIMPLIFIED, by John A. Wills. Published by Dan R. Post Publications, Arcadia, Calif., 1955. 96 pages, $3.

This greatly improved and enlarged book gives clear and complete coverage of the processes involved in fabricating fiber glass automobile bodies.

The author, with the experience of a special background in laminates, developed the practical production method for cold cure or promoter processes of production with polyester resins, as well as the glass fiber female molding system — two universally accepted processes which make this type of construction possible.

Supplementing text on such subjects as glass fiber materials, molding procedure, quantity production molding methods, structural characteristics, surface finishing, filing and painting, are some 100 carefully selected process photographs. An appendix lists materials and suppliers.

PLASTICS TOOLING, by Malcolm W. Riley. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y., 1955. 133 pages, $2.50.

This small book is a status report on plastics tooling summarizing all the information, both published and unpublished, concerning the use of plastics in jigs and fixtures, metal-forming dies, plastics-forming molds, die molds, and prototypes. Fully described are the types of tools now being made of plastics, the resins used, how the tools are fabricated, how long they last in service, what they cost, etc. The discussions of plastics resins are not highly technical.

SUPERVISORS SAFETY MANUAL. Published by National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill., 1956. 354 pages, $3.25 to members, $6.50 to nonmembers.

Written by staff engineers of the Council's industrial department and carefully reviewed by safety experts from business, industry and government, the manual provides foremen with a comprehensive guide to all phases of industrial safety.

It can be used as a text for group training or self study or as a reference work to solve most of the general safety problems encountered by

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A production sequence
using GROTNES machines only
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The manual includes material on the human side of safety, maintaining interest in accident prevention, first aid, protective equipment, housekeeping, materials handling, machine guarding, portable power tools and fire prevention.

SUCCESSFUL HANDLING OF LABOR GRIEVANCES, by Bertram R. Crane and Roger M. Hoffman. Published by Central Book Co., Inc., 261 Broadway, New York 7, N. Y., 1956. 307 pages, $5.95.

Every year millions of man hours are consumed in the investigation and adjustment of industrial disputes under existing contracts. Much of this unproductive energy is expended in spite of the fact that a formalized grievance procedure is in operation.

This book describes and examines the industrial grievance from the point of origin to the point of final decision-making between the parties. The most successful and practical of techniques as used by management and labor are carefully analyzed, and actual contracts are discussed, clause by clause. It deals with the day-to-day administration of grievance contracts and gives practical know-how in handling labor-management grievance problems from the point of view of management, the foreman, and the shop steward.

Suggested grievance codes originated by the authors, and many grievance forms used by leading companies, enrich the text.

GEARS FOR SMALL MECHANISMS, by W. O. Davis. Published by N.A.G. Press Ltd., 1953. Available in the United States from Huebner Publications, Inc., 1975 Lee Rd., Cleveland 18, Ohio. 157 pages. $5.

Special problems arise when small gears are applied in instrument mechanisms, watches, clocks, etc., says the author. The purpose of the book is to elucidate these problems that are encountered when designing and using gears for small mechanisms.

Theory and practice of the design of small gears, friction and the efficiency of tooth action, design of tools for cutting and generating gear tooth forms, and the production and testing of small gears are among the subjects covered.

The author, for 20 years an engineer who has specialized in small gears and mechanisms, includes data sheets on standard forms of gearing and a glossary in an attempt to show how gearing used for years in clocks and watches can be applied to modern precision mechanisms.

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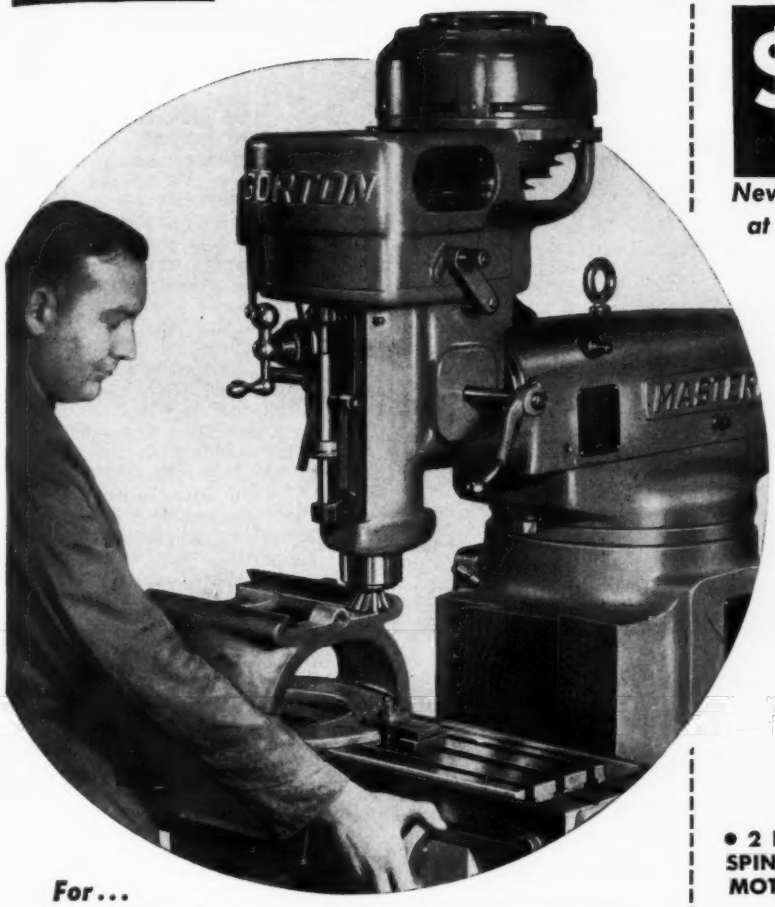

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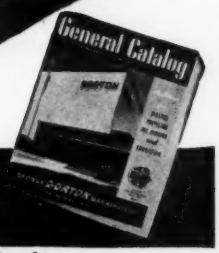

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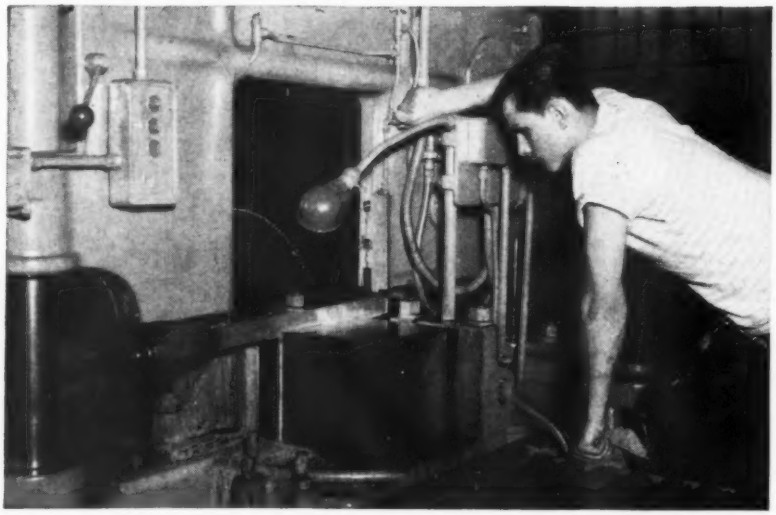

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Kenilworth Steel Company, Kenilworth, N. J., has been named a special processing distributor for Armco Steel's Aluminized Steel. Aluminized Steel is made by a patented process of applying molten aluminum to cold rolled steel and has a wide variety of uses, including car mufflers, cabinets, ranges, and aircraft fire walls.

Precision Gage Co., New York City, now represents the Pipe Machinery Company of Wickliffe, Ohio, in the New York City, Long Island and Westchester territory.

Basco Sheet Steel Separators are now being handled in the Detroit area by the Boyer-Campbell Co.

The Timken Roller Bearing Company has appointed Alloy Steels, Inc., Detroit, as distributor for Timken Graphitic tool steels, bars, billets and hollow shapes. A. Milne and Company and Peninsular Steel Company will both continue to handle Graphitic tool steels in Detroit and other cities where they maintain warehouses.

Jergens Tool Specialty Co. of Cleveland is now a distributor for Turnomat centerless turning machines, attachments and accessories, manufactured by Turnomat Co., Inc. of Brockport, N. Y.

A manufacturers representative for Texas has been named by Size Control Co., manufacturer of fixed industrial gages. Wallace Co., Inc., with headquarters in Houston and a branch office in Dallas, now represents Size Control throughout the state.

Southern Tool and Equipment Co., Memphis, Tenn., is now representing Porter Precision Products in the Memphis area and northern Arkansas.

Jarvis Supply Co., Inc. of Denver has been named distributor for the complete Wesson and Wessonmetal lines of carbide metals and cutting tools in the state of Colorado.

Ball Machinery Co. of Chicago is now distributor for Harrison lathes in the Chicago area.

Norton Company has appointed Rudel Machinery Co., Inc. as distributor for Norton grinding and lapping machinery in eastern New York, northern New Jersey, Connecticut and western Massachusetts. This will supplement Norton's own direct sales activities which have been carried on in these areas from the Teterboro, N. J., office.

Appointment of Creole Engineering Co., New Orleans, as sales representatives for Valvair products in Louisiana has been announced by Valvair Corp. of Akron, Ohio.

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NEW DESIGN . . . . . more powerful
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8500 RPM. . . . . fast grinding

ONLY 8½ LBS. . . . . . less fatigue
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SPECIFICATIONS

WEIGHT . . . . . 8 lbs., 8 oz.
LENGTH . . . . . 20½"
(19" for spade handle model)
SPEEDS . . . . . 8500 RPM
6000 RPM
EQUIPMENT (Standard)
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The big difference is in the new motor. Some grinder!

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THE ROTOR TOOL CO.
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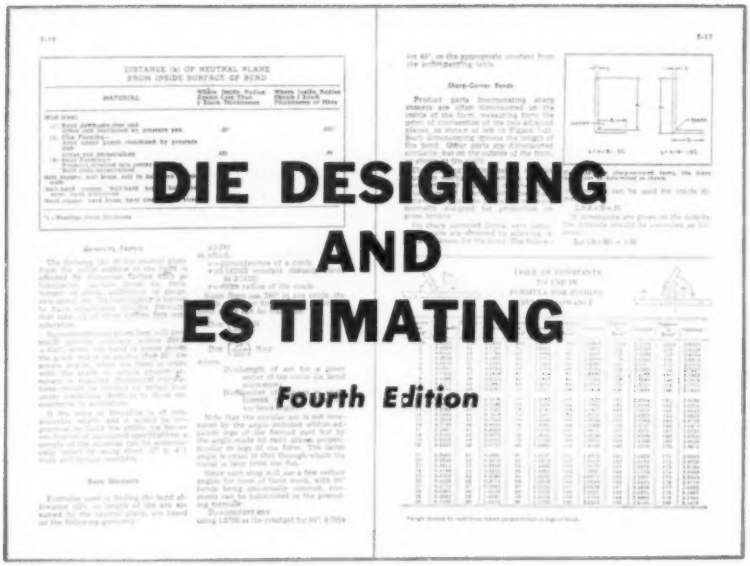

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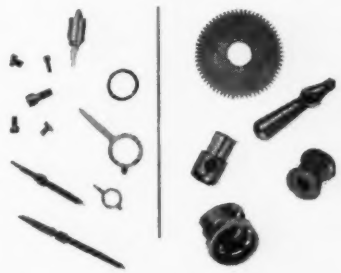
The technology, equipment and *very* special manpower skills that mass-produce shafts as small as .0028" diameter, screws as fine as 340 threads to the inch, ¼"-diameter gears with 64 teeth and heat-treated small stainless steel parts to exact specifications . . . these are typical of the skills you can draw on for economical, quality production of small components and/or assemblies.

. . . Obtain faultless heat treating of small parts



Here you'll find special Hamilton furnaces that bright-harden small martensitic stainless steel parts to *any* specified hardness. Using controlled atmosphere, vacuum, or a combination of both, these furnaces plus our specialized techniques *completely* prevent discoloration—actually improve the finish. This same equipment and skill salvage rejected stainless steel parts by *correcting* dimensional errors through heat treating.

. . . Strengthen your miniaturization production weak spots

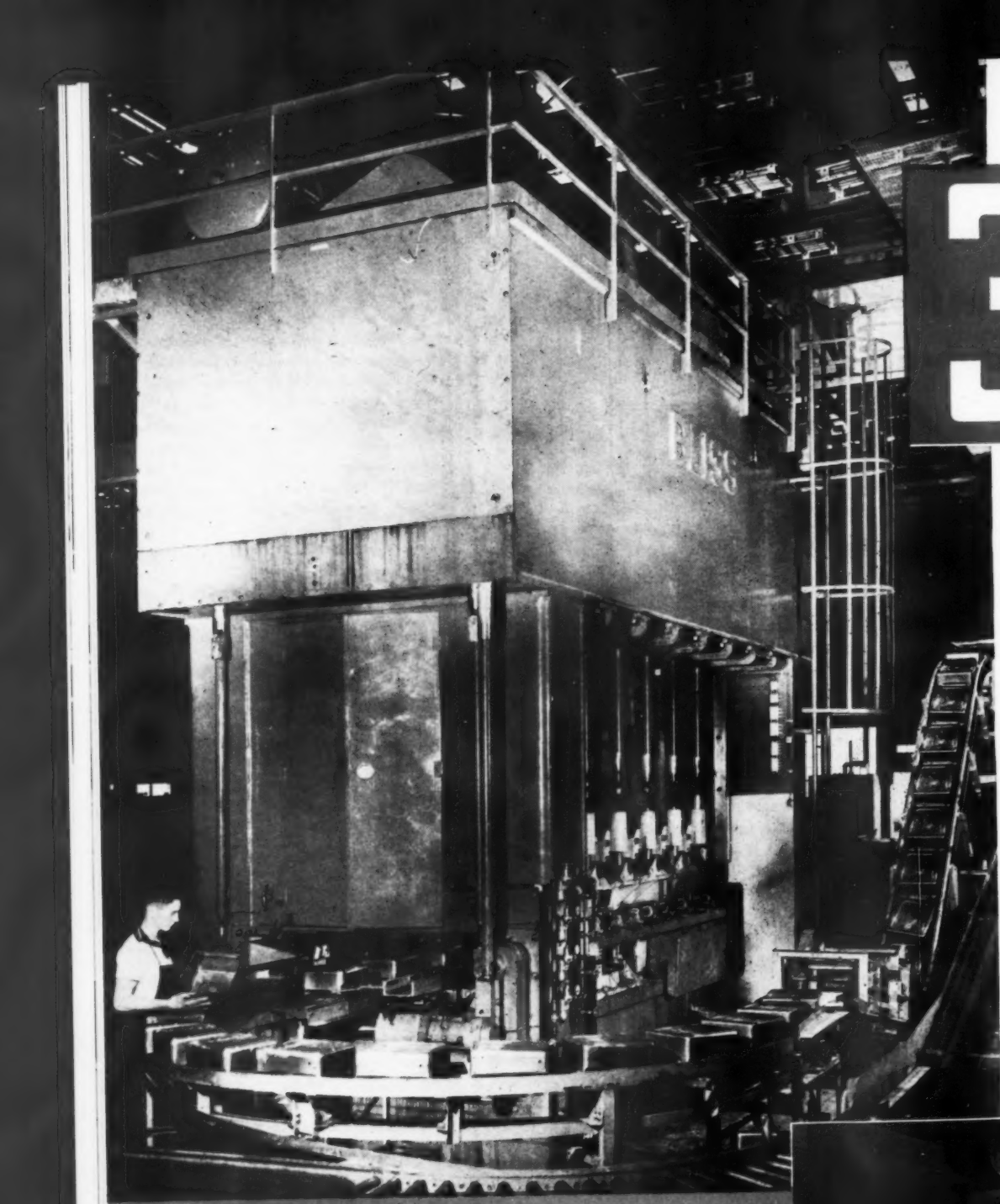
Do you make parts with tolerances of tens of thousandths? Are you producing small parts and assemblies for guided missiles, electro-mechanical devices, synchros, servo motors and the like? If so, you need special gages, tools and other micro-machining equipment . . . together with methods and techniques generally unavailable. Come to Hamilton for these special services. Write for 32-page, illustrated booklet. No obligation!

HAMILTON WATCH COMPANY

Allied Products Division

Lancaster, Pennsylvania

CIRCLE INFORM-A-GRAM KEY NO. 121



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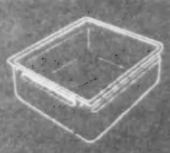
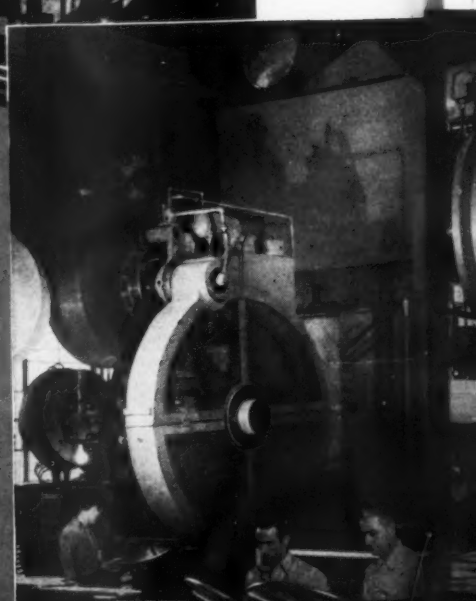


THIS ONE MAKES PANS . . . Pans are produced at the rate of ten a minute in this 700-ton seven-station Bliss transfer feed press. A 22" x 24" blank is drawn 5 13/32" deep in the first station; trimming, piercing and restriking operations follow. Pans leave the press completely finished — ready for pickling and enameling.

THESE TWO MAKE SHELVES . . . "Lazy Suzan" shelves by the millions are the product of these two 800-ton Bliss transfer feed presses and the two Bliss embossing presses stationed at their output ends. Coil stock is blanked in the first stations of the presses and work pieces carry through the remaining five stations and into the embossing press automatically. Each press produces 15 shelves per minute through two shifts.



BLISS TRANSFER FEED PRESSES STEP UP GE REFRIGERATOR PRODUCTION

Between them, they make all the pans and all the shelves GE needs for its annual output of more than half a million refrigerators!

Here's what's happening at Appliance Park: 6000-pound coils of steel feed into one end of these Bliss transfer feed presses, lines of shelves and pans march out the other ends, and only a few attendants stand by in between.

Three separate press lines are involved. One is a 700-ton, seven-station press (with coil cradle, straightener and roll feed) that produces ten deep-drawn pans a minute.

The other two — identical set-ups — are 800-ton, six-station presses, also with cradle, straightener and feed, which feed into 800-ton embossing presses (see photo). Each produces shelves at the rate of 15 per minute.

The method of operation is the same for all. Mill coils are loaded on the cradle. From there, strip feeds through the straightener and into the roll feed. At the first die station in the press a blank is cut off. The transfer feed fingers move in on the work piece and carry it to the next station. As the slide comes down, the fingers move out; as it rises, they move in and repeat the cycle. New strip is brought to the first station and a completed part delivered with every stroke of the press.

This set-up has solved a number of knotty problems for General Electric. Previously production required the services of two or three vendors, doubling and tripling the cost of dies and labor. Still further savings have come from the use of standard mill coils instead of blanks. In fact, the savings are expected to bring about an early amortization of the entire installation.

Bliss has been building transfer feed presses and systems like this since Spanish-American War days; today, over a thousand are in use. If you're faced with long-run production problems, let a Bliss engineer show you some typical uses of the transfer feed principle. Perhaps it can pull your production costs into line — as it has for so many others.

SEE IT IN ACTION . . . *A new color-and-sound movie takes viewers to the plant, shows the press in action. See close-ups of tooling, of transfer fingers, of coil feed techniques. To arrange a showing at your plant, write to E. W. Bliss Company, Canton, Ohio, or see your local Bliss representative.*

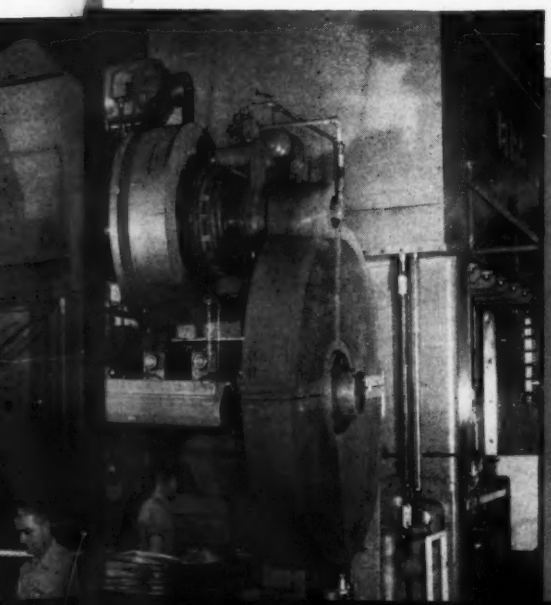
BLISS
SINCE 1857

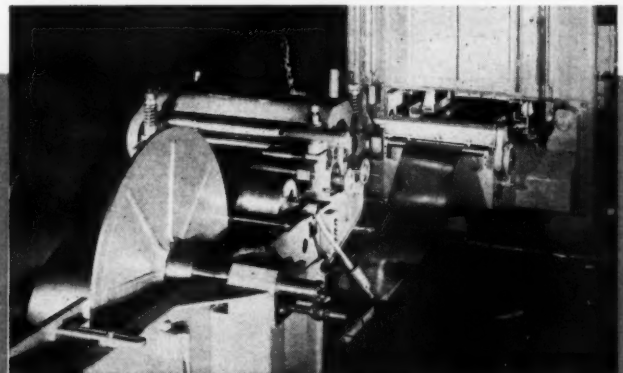
E. W. BLISS Company, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

is more than a name... it's a guarantee

U. S. Plants in **Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, Calif.** ***Branch Offices in*** **Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France.** ***Other representatives throughout the world.***





ALL THREE LINES WORK FROM COIL STOCK . . . A number of handling operations are eliminated because, on each of the three presses, strip from standard-sized mill coils are fed from this power coil cradle through a five-roll straightener and into the roll feed on the press. Blank is cut off in the first die station of the press. Though not shown here, a second coil is ordinarily held ready at the rear of the cradle to speed handling. Bliss engineers designed all the coil handling equipment and all of the tooling for each of the presses.

NEW YORK

"An irregular-shaped hole being ground to within .0002" on the No. 2 Moore Jig Grinder. The machine can do contour grinding of almost any size and shape."—*from facilities booklet of August W. Holmberg & Co., Inc., Flushing, N. Y.*

MISSOURI

"Two No. 2 Moore Jig Borers...permit Ehrhardt to locate and bore holes accurately and to inspect the finished work."—*from facilities booklet of Ehrhardt Tool and Machine Co., St. Louis, Missouri.*

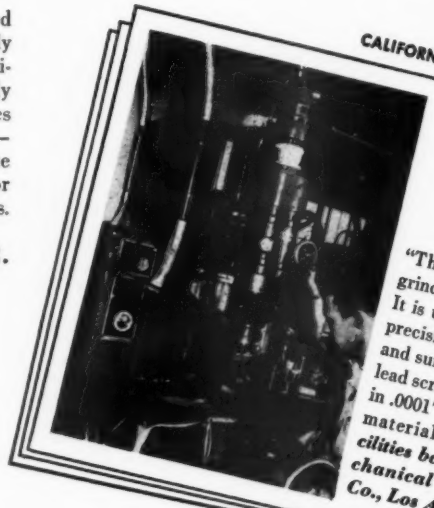
"FACILITIES, FACILITIES, FACILITIES..."

How Leading Tool and Die Shops Across the Nation Feature MOORE Jig Borers and Jig Grinders

Today, top contract tool and die shops often rely on illustrated booklets to sell prospects on their facilities. And they often rely on pictures of their Moore Jig Borers and Jig Grinders to indicate the degree of precision work they can do. It's particularly significant that leading contract shops choose Moore machines for "double duty"—in the toolroom and on the printed page—for these owner-managed firms are understandably deliberate and judicious in selecting machine tools. Write today for detailed bulletins on Moore's top-billed toolroom teammates.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut

CALIFORNIA



"This precision jig grinder is a Moore No. 2. It is used for producing precision holes, contours and surfaces to accurate lead screw settings within .0001" in heat-treated materials."—*from facilities booklet of Mechanical Specialties Co., Los Angeles, Cal.*

HOLES, CONTOURS AND SURFACES
Moore's *all-new* book tells you how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 124

SPEED KING

the only valve guaranteed against coil burnout for life

Now—for the first time—you can eliminate coil burnout, the major source of valve trouble. That's because Speed King valves are *guaranteed against coil burnout for the life of the valve.* Unique design of Speed King valves minimizes inrush and holding current in solenoid coils. Furthermore, coils are encased in molded epoxy resin . . . proof against moisture, oil, dust and vibration.

And the Speed King gives you many other "plus" advantages, too. Users report Speed Kings regularly operate over 20 million cycles. In addition to being guaranteed dependable, Speed King valves are built to JIC standards . . . are compact . . . easily adapt to any requirements for air, hydraulic or vacuum applications . . . have full line of optional attachments . . . *and are available for immediate delivery from stock.*

Check your valve requirements critically. Check performance, features, materials, guarantee, delivery. Compare—and you'll specify Speed Kings. Valvair Corporation, 154 Morgan Avenue, Akron 11, Ohio.

Double solenoid Speed King shown. Single and double solenoid types in ¼, ⅜, ½, ¾ and 1" pipe sizes for foot, sub-base and manifold mounting. All air valves bubble tested under water.

Valvair

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Representation in: Baltimore • Birmingham • Boston • Charleston, W. Va. • Chicago • Cleveland • Cranford, N. J. • Dayton • Denver Detroit • Eureka, Calif. • Houston • Kansas City, Mo. • Kenmore, N.Y. • Logansport, Ind. • Louisville • Minneapolis • S. Pasadena Philadelphia • Pittsburgh • Portland, Ore. • St. Louis • Seattle • San Francisco • Syracuse • Montreal • Toronto • Vancouver

AA-0815

CIRCLE INFORM-A-GRAM KEY NO. 125

When you want the BEST...

Boyar-Schultz 6x18 *HYDRAULIC* SURFACE GRINDER

Compare these features—

1 – Totally enclosed vertical and transverse ways, seal out grit and abrasive affording longer life.

2 – Spindle column rides transversely on ground cylindrical bars, affording easier access to work area and guarantees closer accuracy in grinding.

3 – Newly designed Hydraulic valve affords smooth, trouble-free stroke.

4 – Automatic handwheel engagement allows fast change from hand feed to hydraulic, and vice versa.

5 – J.I.C. Electrical Controls as standard equipment at no extra cost.

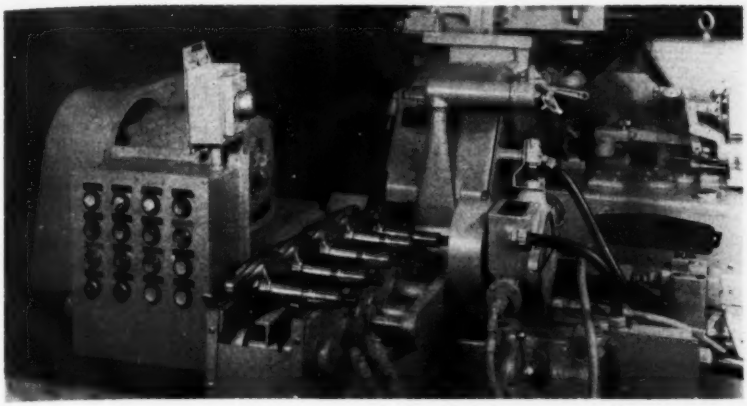
6 – Hardened and ground tool steel bed ways affording long life and greater accuracy.

Available in both *HYDRAULIC or* HAND FEED Models

BOYAR-SCHULTZ CORPORATION

2012 SOUTH 25TH AVENUE, DEPT. C-N, BROADVIEW, ILLINOIS

Automatic Machine for Grinding Stem Pinions



Important features of a newly developed automatic stem pinion grinder include special workholding and driving equipment with automatic loading and unloading devices.

Automatic controls incorporated into this machine, developed by Norton Company, Worcester 6, Mass., permit one operator to supervise the production of more than one machine. Many of the time-proved features of Norton's CTU cylindrical grinders are included in this special purpose grinder.

Because of the awkward, top heavy characteristics of automotive type pinions, there has always been a high fatigue factor in manual loading operations. In this new grinder, the pinions are placed in a loading chute which automatically moves the pinion down inclined ways toward a revolving turret. The turret then places the pinion in position for the footstock center to engage the center hole and push the pinion forward into the floating type collet on the headstock. The grinding cycle time is pre-selected on the basis of stock removal and finish requirement. Upon completion of the grind, the revolving turret takes the pinion from the centers and discharges it into an unloading chute from which it rolls onto the conveyor on the front of the machine.

Grinding wheel truing is automatic at predetermined intervals by means of a wheel head mounted device that contributes important time savings, especially if wheel forming is required. In addition, this device gives close control of the amount of abrasive removed from the wheel face. The wheel head is automatically reset to compensate for the reduced wheel diameter after truing.

Interlock controls assure that automatic actions occur in proper order. Improper action shuts down the machine.

Automated 8-Station Drum Type Machine

Four new Barnesdril special 8-station drum type machines were recently completed for a midwestern plant of a large automotive manufacturer for completely automated drilling, chamfering, reaming, and tapping operations on a rear axle drive gear.

The gears are delivered by conveyor to a loading pocket on the machine. With a completely interlocked cycle, the machine automatically picks up the gears by a loading arm which moves them to the loading position. Here they are clamped in the holding fixture. In order to minimize the cycle time for the operation, the drilling is divided and performed at stations No. 2 and No. 3.

At station No. 4 a chip blowout unit cleans the holes and they are gaged by an automatic probing unit. Chamfering takes place at station No. 5. All holes are reamed at station No. 6. Five holes are tapped at station No. 7 and the remaining five are tapped at station No. 8. After the part has been indexed back to station No. 1, it is automatically unclamped and the unloading arm picks it up and moves it to the discharge chute for conveyor removal. At the same time the loading arm picks up a new gear and moves it to the loading station.

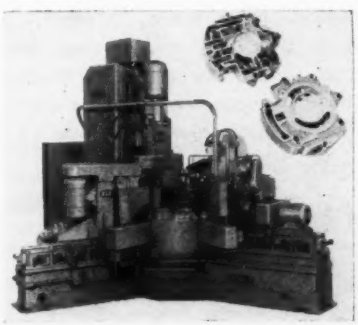
If inadequate depth of the holes or broken tools are found by the probing unit at station No. 4, the machine is automatically stopped and a warning signal is actuated. The machining cycle is resumed after the part has been removed through the reject chute, and proper tool corrections are made.

Production exceeds 200 per hour at 80% efficiency. These machines were designed and built by Barnes Drill Co., 862 Chestnut, Rockford, Ill.

Retooled Special Machine Processes Altered Workpiece

Changing a workpiece from its original form need not make obsolete the special machine used to produce it.

The unit pictured here is typical of such a special machine, redesigned and rebuilt by Ex-Cell-O Corporation, Detroit, to process a workpiece thus changed. While this involved no major alterations, certain changes in the tooling and operational cycle of the machine were necessary. As rearranged for its new production job, this special machine is equipped with a 6-station rotary indexing table. Each station has two fixtures, to permit reloading for operations on the reverse side of the part, after the first side has been machined. A hydraulic cam clamp retains the workpiece through the machining cycle.



The workpiece is an aluminum regulator valve body for an automotive transmission. Machining includes flycutting both flat sides, drilling and reaming two piston holes, drilling three angular holes, drilling, reaming and chamfering the top holes. Perfect flatness of the two sides is an important requirement. Net production rate is 120 parts/hr.

As pointed out by Ex-Cell-O engineers, the use of standard components in the machine assembly assures a high degree of flexibility. It is seldom that a change-over to the production of an altered workpiece cannot be made quickly, with efficiency and at desirable low cost.

FOR FAST, ECONOMICAL METAL CUTTING

the BIG NEW J

18 INCH SQUARES

10 INCH ROUNDS

IRREGULAR SHAPES, TOO!

JOHNSON MODEL J
Heavy-Duty
(Wet and Dry Models Available)

Check These Features

Fully Automatic Operation. Shuts off automatically when cut is completed.

Operator Safe Design. The entire saw and wheel assembly is guarded.

3 Point Suspension. Uneven floors will not affect accuracy of cut.

Extreme Strength. Rigid box-type frame with wide, heavily ribbed bed.

Centralized, Up Front Controls. No more reaching over, around, or behind the machine.

GET ALL THE FACTS on the Model J and other Johnson models. Send for literature today.

Now you can quickly and accurately cut anything in your stock pile with the new Johnson Model J Band Saw. Tubes . . . rods . . . angles . . . heavy rounds . . . flats, and irregular shapes. And, you get MORE saw for LESS money. The Model J costs less than any comparable saw on the market today. It's fast, it's tough, and it's accurate.

Johnson MANUFACTURING CORPORATION
1015 BARNES STREET • ALBION, MICHIGAN

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R. J. R. KELLY CO.	W. Q. LUNDMARK	HASTINGS DISTRIBUTORS
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CIRCLE INFORM-A-GRAM KEY NO. 128

Special Machines

Multi-Operation Machine Saves Four Setups

A special duty milling and drilling machine, designed and built around a standard Cincinnati duplex mill by the Torrance Facility of the Douglas Aircraft El Segundo Division, is automatically machining heat treated F40 arresting hooks at one setup in 1/5 the former operating time.

Previously, five machine setups were necessary on a variety of machines to mill two attachment fittings, to straddle cut a clevis, and to bore and drill three holes to precise tolerances.

To the front of a standard duplex mill was built a variable speed Romulus hydraulic head whose capacity is boosted by bull gears. On its spindle are carried the three cutters that straddle mill the clevis which, in flight, will accept the lowering and raising mechanism.

Built to the front of this head are two modified Keller air feed drills which drill through the drill bushings seen in the photograph. Opposite the second drill in line is the third Keller air drill (lower left in the photo) and all three use carbide-tipped gun drills.

After the arresting hook has been properly secured in its rigid holding fixture on the bed, it moves into the machine and the following operations occur in automatic sequence:

- The two ends of the legs are line bored and the clevis is drilled by the Keller units.
- The bed advances into the machine and the clevis is straddle milled by the Romulus head.
- Moving forward again the bed carries the part into the cutters of the duplex and the sides of the ends of the legs are gang milled. The completed part is then unloaded. Carbide cutters are employed.

Automatic Indexing and Assembly Welding Machine

A new automatic 12-station index welder, featuring a continuous-running cam drive that controls index and weld sequences, is now being built for production welding. Use of this type of drive simplifies sequence timing functions; the welds being made when the 5-rpm cam is in dwell position.

The machine, developed by Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, welds 1,200 two-piece, right- and left-hand auto-

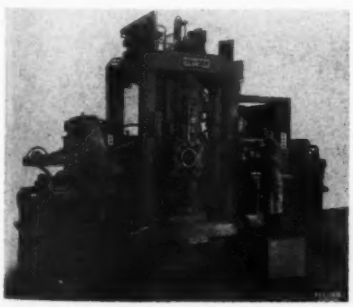
Special Machines

motive hood hinge stampings together per hour with nine spot welds. Both right-hand and left-hand parts are welded in adjacent fixtures on the 6' dia index table. The parts are clamped in the 24 fixtures by stationary air-operated clamps at the welding stations. Both transformers and hydraulically powered welding guns for the four weld stations are suspended from an upper platform supported by four tubular steel columns.

Since both right-hand and left-hand parts are welded on the machine, unique air-operated ejector mechanisms are provided at separate stations to separate the right from the left-hand parts and deposit them on individual conveyors. A part detector mechanism checks each fixture for load condition at a station ahead of the weld stations and shuts off the machine if no part is in the fixture.

Vertical Trunnion Index Machine for Machining Housings

A new 5-station vertical trunnion index machine, that cuts floor space requirements for machining long parts such as automotive axle housings, has the space-saving advantages of a center-column type machine tool, but has no index table as such. Instead, the center column itself holds the work fixtures and rotates the parts from station-to-station. Upper and lower tapered roller bearings support the trunnion. Four tubular steel columns support the upper outboard bearing frame.



This hydraulically operated, electrically controlled machine, built by Snyder Tool and Engineering Co., 3400 East Lafayette, Detroit 7, rough and finish faces the housing banjo flange, drills and reams 10 holes in the flange mounting face, and chamfers both sides of the holes.

Three single-point carbide tools are used to rough and finish the flange. This type of tool design was selected to avoid large thrust loads that conventional spotfacing tools would impose on such a large diameter. The individual carbide tools are mounted in block assemblies that are preset and ground. A large hydraulic cylinder advances the tools across the face during machining, through a drawbar and bell crank mechanism.

Chucking of the long welded housing assembly is a critical operation. To chuck the housing, it is loaded in the fixture over a lower arbor that enters a semi-finished bore. Then the upper arbor enters the semi-finished bore in the other end of the housing. Next a centralizing locator on a swinging gate is moved into position in the housing. Then a jaw chuck clamps the housing flange section based on the location indicated by fingers on the locator which bear on the inside surface of the flange outside diameter. When the locator gate is swung out of the work, the machine indexes to the first machining station.

New ALIGNING BUSHING

for Small Turret Lathes and Single Spindle Automatics

CURRENT STOCK SIZES		
O. D.	I. D.	ECCENTRICITY
1"	¾"	.016"
¾"	½"	.016"
⅝"	½"	.016"

other sizes available on special order

Cures Mis-alignment Simply...but Accurately

That old bugaboo — machine mis-alignment — is a thing of the past. For now you can compensate for this "trouble maker" with the new J & L Aligning Bushing.

There's no guesswork involved — no approximations — no overhang. And it's *simple* to use.

The complete unit, consisting of a pair of eccentric bushings, both graduated in thousandths, can be set and put into use in a matter of minutes.

What's more, the unit sets flush with the face of the turret. It *adds no length* to your tools.

Write Dept. 710 today for free, illustrated instruction sheet.

JONES & LAMSON

Class III Guaranteed Not Sometimes, but Everytime!

JONES & LAMSON MACHINE COMPANY, 519 Clinton St., Springfield, Vt., U.S.A. J&L THREAD TUOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 129

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

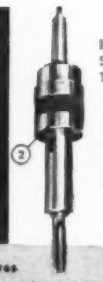
Unbrako Fasteners are the subject of revised Catalog 877 from Standard Pressed Steel Co., Box 600, Jenkintown, Pa. The catalog contains tables showing size ranges and specifications such as number of threads/in, length and quantities per package. Also included are engineering-type drawings. A kit of socket screw keys is introduced and the key folds have been renumbered.
Circle Inform-A-Gram No. B1.

A Progressive Listing of Tools by sizes, with detailed dimensions, is a feature of Catalog 11 announced by Weldon Tool Co., 3000 Woodhill Rd., Cleveland 4. It covers the company's complete line of end mills and holders, Tu-Lip counterbores, new type countersinks and deburring tools, angular cutters, sharpening fixtures and high speed steel and carbide form tools.
Circle Inform-A-Gram No. B2.

Stop tap breakage and scrap

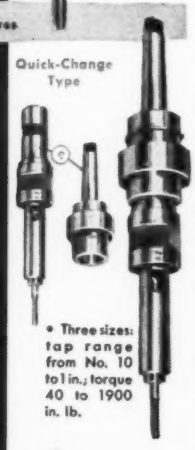
SCULLY-JONES SAFE-TORQUE DRIVERS

NOW AVAILABLE IN NEW STYLES AND CAPACITIES

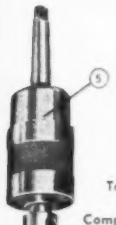


Heavy-Duty Safe Torque Tap Drivers
• Two sizes: tap range from ½ to 1½ in.; torque 500 to 2400 in. lb.

These benefits . . .	for these reasons . . .	result from these PREMIUM features
PREMIUM TOOL LIFE	Reduce tap breakage. Control adverse tapping conditions.	1. One-shot clutch and cam-drive collet completely disengage tap from driver.
		2. Pre-set torque remains constant. Wide range of settings.
PREMIUM QUALITY TAPPED HOLES	Produce uniform, accurate threads.	3. Freewheeling action eliminates impact and objectionable vibration.
	Help prevent use of dull or improperly sharpened tap, or wrong tap for job.	4. Releases instantly at proper setting.
		5. Tension and compression type compensates for feed variation between spindle and tap.
PREMIUM PRODUCTION EFFICIENCY	Operator gains confidence, more free time for other work.	6. No noise or impact on release. Tension and compression type spring loaded.
	Use higher speeds on all tapping jobs.	7. Operates at any speed taps can take.
	Reduce downtime.	8. Gives dependable control over adverse machining conditions.
		9. Quick-change type—change tools without stopping machine.
PREMIUM PROFIT OPPORTUNITY	Driver has long service life.	10. Freewheeling action minimizes wear.



Quick-Change Type
• Three sizes: tap range from No. 10 to 1 in.; torque 40 to 1900 in. lb.



Tension and Compression Type
• Two sizes: tap range from No. 10 to ⅜ in.; torque 50 to 700 in. lb.

SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS

"Precision Holding" for holding precision

Scully-Jones and Company, 1913 South Rockwell St., Chicago 8, Ill.

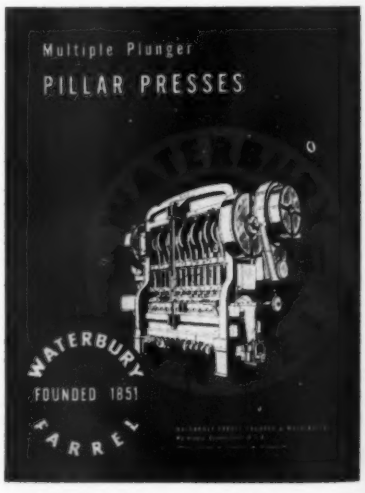
CIRCLE INFORM-A-GRAM KEY NO. 130

Design Standards and Considerations for ball screws are found in a bulletin from Beaver Precision Products, Inc., 651 N. Rochester Rd., Clawson, Mich. Shown are preloaded ball screws and ball splines and typical installations of ball screws. Also included is a chart showing column load conditions.
Circle Inform-A-Gram No. B3.

Color Identified Barrel Finishing Compounds are the subject of a 2-page bulletin. Included is a compound recommendation chart. Discussed are 14 different color-coded cleaners and abrasive and burnishing compounds and their applications. For complete details, get the bulletin from Esbec Barrel Finishing Corp., 18 Beech St., Byram, Conn., or —
Circle Inform-A-Gram No. B4.

Cost Cutting Multiple Tools are highlighted in a catalog from The O. K. Tool Co., Inc., Milford, N. H. Diagrammatical drawings present the specifications of these special tools. Included are mill steps, face locating lugs, piloted line reamer, angular and dove tail end mills, interlocking full radius cutter, face pads and counterbore.
Circle Inform-A-Gram No. B5.

More Efficient Operations, easier operator control, economy of operation and greater flexibility are features of redesigned multiple plunger pillar presses. They will automatically produce various shaped shells

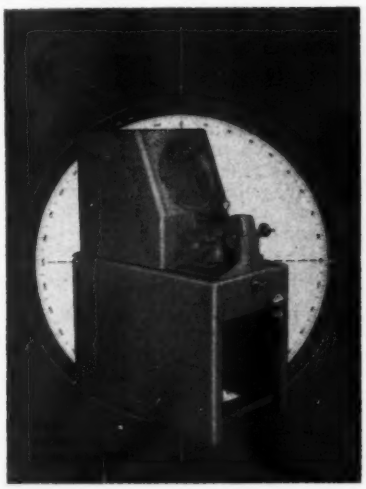


or formed pieces in continuous multiple station operations from the initial strip of metal to the finished product. For details, get a circular from Waterbury Farrel Foundry & Machine Co., Waterbury 20, Conn., or—**Circle Inform-A-Gram No. B6.**

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

A Front Operated, Power Back Gage is now available on Niagara press brakes of 50 thru 150-ton capacities. The gage enables accurate, quick settings without the operator leaving the front of the machine. It is especially valuable for work requiring frequent changes in gage settings. Bulletin 89-D with details is obtainable from Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, or—**Circle No. B7.**

Quick, Economical Precision Inspection in the shop is possible with the No. 14 optical comparator. All measurements are read directly from the indicators. This comparator is a



complete checking unit with a 14" diameter screen. Details, specifications and attachments are found in Bulletin 1456C provided by Covel Mfg. Co., Benton Harbor, Mich., or **Circle Inform-A-Gram No. B8.**

Produce a Constant Source of Brine to —120°F with brine chillers produced by Murphy & Miller, Inc., 1326 S. Michigan Ave., Chicago. These low temperature brine chillers are used for production or test applications. A circular from the company contains details and model selection and brine chiller data charts. **Circle No. B9.**

"10 Things Hired Hands Can't Do . . ." details 10 ways in which lightweight overhead trolley conveyors can cut production costs. These ways are pointed out through typical applications of Model X-228 conveyor. For further details on the types available, Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, will provide copies of Bulletin 954, or — **Circle Inform-A-Gram No. B10.**

Load Carrying Threads can be obtained in thin steel, brass, copper or aluminum sheets with PEM self-clinching nuts from Penn Engineering & Mfg. Co., Doylestown, Pa. These nuts which are installed in drilled or punched holes with standard tools, are available in a wide range of thread sizes and types. Complete information is given in Bulletin CL-356. **Circle No. B11.**

"Sheet Metal Fabricating" details the Wales sheet metal fabricator, showing typical parts produced by the machine and illustrating and describing its features. Included are a capacity chart, specifications and equipment. One section is devoted to punching and notching units. Wales-Strippit Corp., North Tonawanda, N. Y., will provide copies of Catalog 10-AA, or — **Circle Inform-A-Gram No. B12.**

NOW CUT COST OF PRECISION GEAR PRODUCTION

THIS FEATURE: "*Independent* selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,

AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.

THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,

CONTRIBUTES to more gear precision with no sacrifice of gear production,

OR INCREASED gear production with no sacrifice of gear precision, ... OR BOTH!

Prices and specifications without obligation

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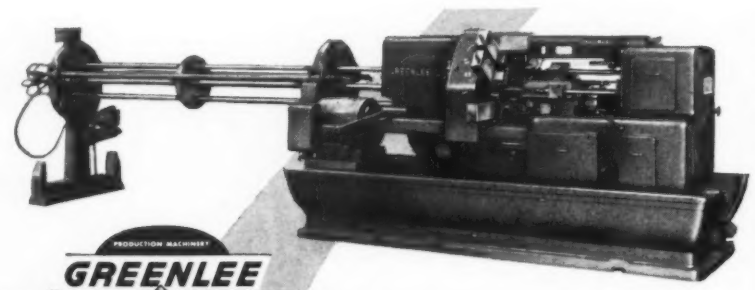
CIRCLE INFORM-A-GRAM KEY NO. 131

Air and Water-Type Hydraulic Oil Coolers for industrial hydraulic systems are featured in a new bulletin. Discussed are the design and construction features of Series OCW and OCA coolers complete with cutaway views. Included are selection charts giving complete dimensions and specifications, installation type drawings, and drawings of typical circuits. Vickers Inc., Box 302, Detroit 32, will make available copies of Bulletin 55-69, or —
Circle Inform-A-Gram No. B13.

Save Time, Work and Money by using a new toolholder for cutting threads. The tool bit used in the Spee-D-Thred holder is secured in a head that rides on a cone point in the main tool body and is backed by a ball joint at the rear. This toolholder is designed for extremely fast, efficient single point threading on a reversible engine or turret lathe. For details, see a bulletin from Easco Products, P. O. Box 587, Ypsilanti, Mich., or —
Circle Inform-A-Gram No. B14.



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1 Permits Greater Job Versatility
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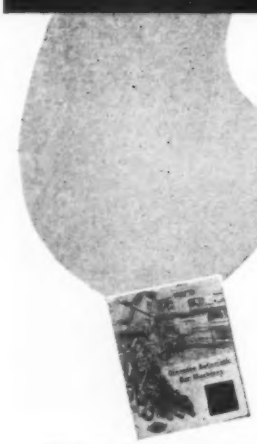
3 Provides Longer Stock Feedout
4 Eliminates Stock Scoring
5 Reduces Stock Reel Noise
6 Eliminates Stock Pushers
7 Eliminates Feedout Cams



Write today for Catalog A-405, or better still, have the Greenlee man call and show you the way to more profitable production with this machine.

GREENLEE
GREENLEE BROS. & CO.
2049 MASON AVE.
Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 132

Template Controlled Tool Bit Grinders are used for grinding single point tool bits to any predetermined contour and combination of clearance. A bulletin discusses the Oliver method of grinding and describes in detail complete with specifications, 20″ and 10″ template controlled tool bit grinders. For complete information, get a bulletin from Oliver Instrument Co., Adrian, Mich., or—**Circle Inform-A-Gram No. B15.**

Designed for Hydraulic and Pneumatic Service is a new line of plane swivel joints. These leakproof, flexible connectors reduce maintenance cost of piping, tubing or hose lines. A ball bearing type for steady or severe service and a thrust bearing type for general use are available. Details are found in Catalog Sheet 406-A published by Barco Mfg. Co., Dept. J-36, 501 N. Hough St., Barrington, Ill., or —
Circle Inform-A-Gram No. B16.

Inside, Outside, Contour and Precision Sanding of metals, etc. is performed by a universal sanding and deburring machine. The Burr-Belter will save money on hand finishing and can be adapted to production line finishing. A bulletin picturing typical applications and discussing the machine is put out by Brubaker Mfg. Co., Inc., Landisville, Pa., or —
Circle Inform-A-Gram No. B17.

Precision Indexing at High Speeds for large volume production is performed by Ferguson intermittor index tables. They operate at speeds up to 30,000 pcs/hr. A catalog details the features and explains how

to choose a standard intermittor. Also given are selection tables for the various dial sizes and dimensions. Copies of Catalog 301 are supplied by Ferguson Machine and Tool Co., P.O. Box 5841, St. Louis 21, Mo., or —
Circle Inform-A-Gram No. B18.

Infinitely Variable Spindle Speeds, a honing range upwards from 0.120 dia and permanent type mandrels with accurate stones are features of Superior honing machines. A bulletin details the features of these machines, their accessories and vertical honing heads. Also covered are mandrels and stones complete with charts. Catalog 1154 can be obtained from Superior Hone Corp., 1605 Elreno St., Elkhart, Ind., or —
Circle Inform-A-Gram No. B19.

Produce Ultra-Surfaces not obtainable by any other finishing method with Cogsdill Bearing-izing tools. These tools are designed for surface finishing and sizing holes, concentric flat surfaces, round shafts, stems, hubs and other contours. The tools available and their features are listed in a bulletin obtainable from Cogsdill Tool Products, Inc., 12980 W. 8 Mile Rd., Oak Park 37, Mich., or —
Circle Inform-A-Gram No. B20.

Base Power Units, Blank Cast Bowls and fabricated supply hoppers are included in the blank equipment manufactured by Vibratory Feeder Co., Erie, Pa. The equipment is used by manufacturers for developing feeders or the blank units by feeder companies for development for a specific operation. The units available are described and illustrated with specifications in Catalog 5631 provided by the company, or —
Circle Inform-A-Gram No. B21.

Files and Rasps are highlighted in a catalog provided by Henry Disston Div'n, H. K. Porter Co., Inc., Philadelphia 35. The company manufactures several brands of American Pattern and special purpose files. The first section of the catalog contains general information on files. The remainder of the catalog is devoted to the various types of files and rasps available, together with size information.
Circle Inform-A-Gram No. B22.

"Cutting and Grinding with Johnson's Wax Cutting Fluids" describes the properties of wax as they assist the cutting functions of the metalworking industry. Included is a comparative machinability table as a guide to selecting the correct coolant. Also given is a complete description of all Johnson's Wax cutting and grinding water soluble coolants and cutting oils. Get your copy from Industrial Products Dept., Johnson's Wax, Racine, Wis., or —
Circle Inform-A-Gram No. B23.

Stamp, Broach, Rivet, Stake, press, shape, bend, coin and assemble with a new air press. It is available as single-acting for impact jobs and double-acting for squeeze and power withdrawals, with a variety of operating controls. The air press is outfitted with two-bolt clamping which adjusts from 0" to 7" in height and has a swing arc of 2". A data bulletin on this air press can be obtained from A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn 38, or —
Circle Inform-A-Gram No. B24.

2, 3 and 4-Way Air Control Valves for high or low pressure installations are illustrated in a 72-page catalog. Among the valves covered are cam, flow control, foot, hand, interlocking, pilot, pressure regulator, quick exhaust, sequence, solenoid, time delay and booster. Each type is treated separately complete with features, specifications and application data. Copies are supplied by Airmatic Valve, Inc., 7317 Associate Ave., Cleveland 9, or —
Circle Inform-A-Gram No. B25.

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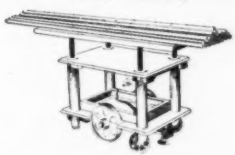

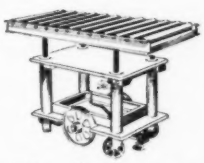

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NEW provision for raising and lowering overhanging loads!

NEW convenience in maneuvering! Six wheel models roll easier . . . turn shorter.

NEW overhanging conveyor tops!

More stamina, more versatile performance than ever before

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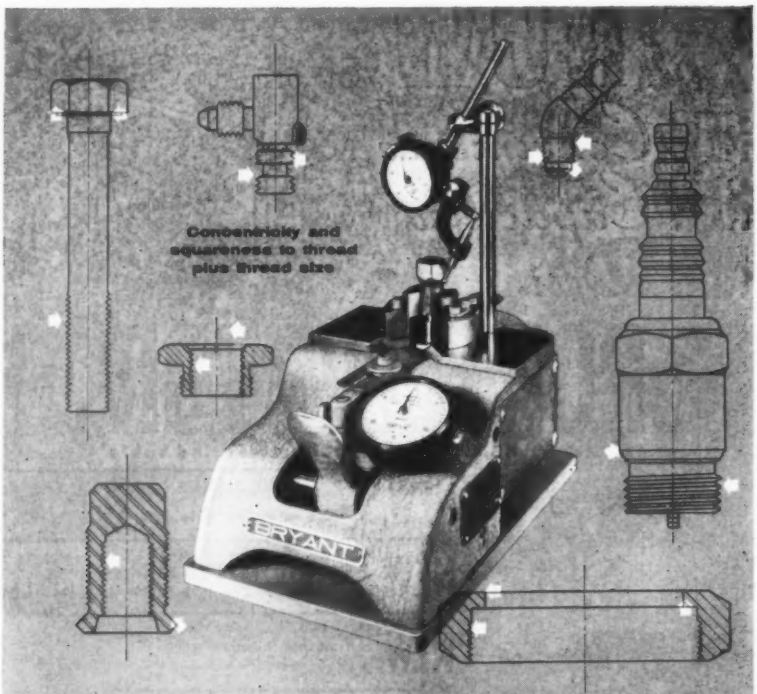
CIRCLE INFORM-A-GRAM KEY NO. 133

Count Only Work Actually Performed with a telemetering work load cycle counter. It is actuated by sensing the current flow to electrically-driven machines such as presses, broaches, drills and mills. The unit is adaptable for accurate proximity or impact counting. The telemetering feature permits simultaneous counting at the machine and at a remote location. Request literature on the load cycle counter from Ram Meter, Inc., 1100 Hilton Rd., Ferndale, Detroit 20, or —
Circle Inform-A-Gram No. B26.

A Patented Gland Design is featured in Densmore heavy duty double and single acting cylinders. A method of prestressing the snap ring within the cylinder permits streamlined design and easy maintenance and assures perfect rod alignment. The cylinders which are available from 2½" through 4" bore and from 1" through 18' stroke, operate up to 1500 psi. A bulletin from Densmore Engineering Co., Inc., 235 Greenleaf St., Compton, Calif., gives details and specifications, or —
Circle Inform-A-Gram No. B27.



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Gentlemen: ☐ I am enclosing a print of my part. Please send me a quotation. ☐ Please send literature and prices on the complete line of Bryant Gages. ☐ Please have Bryant representative call.

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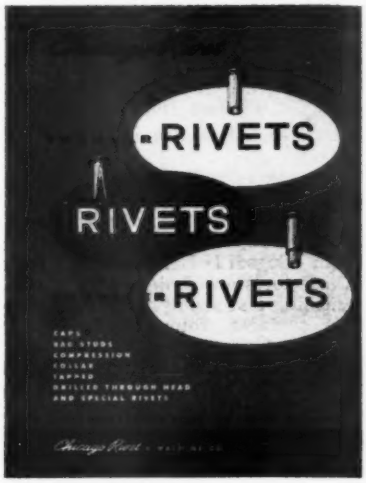
CIRCLE INFORM-A-GRAM KEY NO. 134

Detailed Dimensional Descriptions of 1388 standard semi-tubular, full tubular and split rivets, and bag studs and rivet caps are contained in a new catalog, complete with selection information. Also pictured are



26 single and multiple automatic rivet setters. Copies of Price List No. 42 are available by writing to Chicago Rivet & Machine Co., 950 S. 25th Ave., Bellwood, Ill., or —
Circle Inform-A-Gram No. B28.

Useful for Pilot Model Assembly in experimental departments, etc. is a dust free work bench. Model 10 Sterilshield Cabinet is a portable, self-contained unit with a slightly smaller workspace area and air cleaning unit than previous models. Details on the dust free work bench are found in Form SC 100 made available by The Baker Co., Inc., Maplewood, Me., or —
Circle Inform-A-Gram No. B29.

Increase Production and Lower Costs with a Paquin hopper feed. Model 40-B automatically selects and feeds screws, bolts, nuts and hundreds of special parts. It can be used with riveting and threading machines, drill and punch presses, production lathes, etc. For details on Model 40-B, get a circular from Northeast Engineering, Inc., 55 Millbrook St., Worcester 5, Mass., or —
Circle Inform-A-Gram No. B30.

Paint Faster with Less Material when using DeVilbiss hot spray equipment. With this equipment there are fewer rejects, smoother finishes and easier application. A bulletin lists and discusses the advantages of the equipment and explains how the method assures the best results. Form F-286 with complete details is supplied by The DeVilbiss Co., Toledo 1, O., or —
Circle Inform-A-Gram No. B31.

Machine Steel from the finishing cuts to the medium roughing range of operations with Firthite TXL, a high production carbide. This carbide grade has the highest hardness-to-strength ratio achieved so far in a cutting grade for the intended range of operations on steel. A 4-page bulletin, with graphic chart and performance reports, describing TXL is supplied by Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, or — **Circle Inform-A-Gram No. B32.**

Transfer Feed Efficiency Plus Flexibility are found in the Clearing Transflex press. A bulletin shows some of the engineering concepts which were used in creating the multi-purpose Transflex press equipment. These include variable length of feed stroke, adjustable feed fingers and cushion positions, moving bolster and two-way feed, to list a few. For complete information, get Bulletin SB27 from Clearing Machine Corp., Div'n of U. S. Industries, Inc., 6201 W. 63rd St., Chicago 38, or — **Circle Inform-A-Gram No. B37.**

Capacities from 400 to 2000 Tons are found in the Danly line of single-, double- and triple-action underdrive presses. These presses are designed for volume production of large stampings. Catalog illustrations provide close-ups and detailed views of special design and construction features. Complete specifications and dimensions are also listed as well as press accessories. Copies of the Underdrive Press Catalog can be secured from Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, or—**Circle No. B38.**

Toolholders and "Throw-Away" AlSiMag Ceramic Inserts are now available from Wendt-Sonis Co., Hannibal, Mo. Catalog 56-C covers negative rake and positive rake toolholders listing the ceramic inserts and chip breakers to be used with each. The toolholders cut production costs, reduce tool inventory and eliminate chip breaker grinding. Also noted are replacement parts for each of the two types of holders. **Circle Inform-A-Gram No. B33.**

Diamond Dressing and Trueing Tools, cutting and boring tools, powder, compound and plated mandrels are discussed complete with pictures and tables in Catalog 5 issued by Diamond Tool Research Co., Inc., 380 - 2nd Ave., New York 10. Included are blueprints of the tools and tips on selecting the right diamond tool for the job. These tools for ground thread, gear tooth, radius and form work are centered to 0.001". **Circle Inform-A-Gram No. B34.**

Type TR Twin Rotary Grinders are described in detail in Catalog TR56 released by Thompson Grinder Co., Springfield, O. Photos of the machines with description and location of controls and other features, complete with specifications, are included. Also given are diagrams, floor plans and clearance charts. For a copy of the new catalog, contact the company, or — **Circle Inform-A-Gram No. B35.**

High Production Precision Threading by the thrufeed method is performed by the No. 1 centerless thread grinder. It is also used in the infeed grinding of headed or shouldered workpieces. Landis Machine Co., Waynesboro, Pa., will make available copies of Bulletin 3-97-1 containing data on construction, grinding methods and applications and listing specifications. **Circle Inform-A-Gram No. B36.**

HAMILTON Varimatic®

SUPER SENSITIVE
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to drill holes (.004" to 5/16") in all drillable materials, to the most exacting specifications and on the most relentless production schedules.

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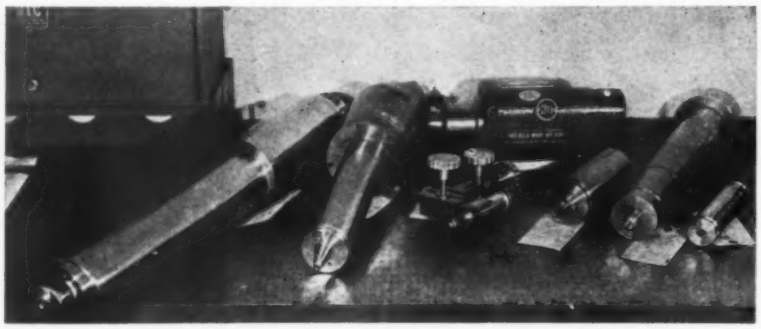
CIRCLE INFORM-A-GRAM KEY NO. 135

The Sheet and Strip Handling Line produced by Fried Steel Equipment Mfg. Corp., 528 E. 119th St., New York 35, is described in an illustrated catalog. Detailed are the features and operation of the Stripveyor, stationary Strip-Stacker, the Liftveyor and the Coilveyor. Also included are the Scrap Eliminator and the Beltveyor.
Circle Inform-A-Gram No. B39.

Filters for raw water, light process liquids and centralized coolant systems will handle up to 15,000 gpm in a single unit and can filter down to 0.0025". They are automatically self-cleaning and occupy small floor area. Details on the Flo-Klean filters are found in revised Bulletin 052 from Cuno Engineering Corp., Meriden, Conn., or —
Circle Inform-A-Gram No. B40.

Precision Surface Equipment is the subject of 8-page Catalog 838-V released by The Challenge Machinery Co., Grand Haven, Mich. Complete information is given on angle plates, V-blocks, box parallels, universal right angle irons, etc.
Circle Inform-A-Gram No. B41.



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CIRCLE INFORM-A-GRAM KEY NO. 136

A Wide Assortment of die springs is covered in Bulletin 556 released by Standard Die Set Mfrs., Inc., Paoli, Pa. Included are chrome-vanadium

die springs, and compression, extension, machinery brake and shear and square wire springs. Copies of the bulletin with ordering information and prices can be obtained from the company, or —
Circle Inform-A-Gram No. B42.

Cut Taper Hole Costs with the Tree taper-boring tool. This boring tool, which bores tapers up to 10" dia, can be adapted to the milling machine, jig borer and boring bar. Model TB-4 tool eliminates costly setups and the need for special taper tools. The operation of the tool and its specifications and features are found in a bulletin from Tree Tool & Die Works, Racine, Wis., or —
Circle Inform-A-Gram No. B43.

Information Needed to Install and Order a Cable Conveyor System, including a diagrammatic plan for layout and dimensional calculations is contained in a 36-page engineering manual issued by Tipp Mfg. Co., Tipp City, O. There is a separate section on the Tipp-Tronic automatic safety controller. Featured is the new standard trolley redesigned for more efficient operation.
Circle Inform-A-Gram No. B44.

"Power Press Brake Dies" illustrates some of the dies in most common use. The dies are grouped for convenience of reference, primarily by the type of bend involved. Included are special purpose dies, ordering information and tables and tips. For your copy of this Press Brake Die Manual, Form D-955, write to The Cyril Bath Co., 32400 Aurora Rd., Solon, O., or —
Circle Inform-A-Gram No. B45.

Cut Heavy Rounds and Flats, angles, structurals and tubing with Johnson metal cutting band saws. They feature larger throat capacity and band wheels, 3-point suspension and simplicity of operation. Several models are available to handle various applications. Complete details are in a bulletin from Johnson Mfg. Co., Albion, Mich., or —
Circle Inform-A-Gram No. B46.

Feed, Orientate and Count Up To 200,000 Items/Hr with the Feed-A-Matic. The high speed hopper is adjustable for size, shape and count. No additional parts are needed to change over from one product to another. The features and applications of the Feed-A-Matic are detailed in a bulletin available from U. S. Engineering Co., 40-24 - 22nd St., Long Island City 1, N. Y., or — **Circle Inform-A-Gram No. B47.**

Typical Installations Using Flexible Shafting are illustrated in Bulletin 570 from Stow Mfg. Co., 82 Shear St., Binghamton, N. Y. The bulletin gives complete information on all sizes of shafting from $\frac{1}{8}$" to $1\frac{5}{8}$" dia, for power driven or remote control applications. Charts aid in the selection of the correct size flexible shaft for a particular application.
Circle Inform-A-Gram No. B48.

Provide Power for automatic welding applications with Lincolnweld power sources. A bulletin lists power source models that can be used for AC and DC welding operations. The bulletin also discussed their features, construction and applications and gives specifications and dimensions. Contact The Lincoln Electric Co., Cleveland 17, for copies of Bulletin SB-1358, or —
Circle Inform-A-Gram No. B49.

No Cams are needed with a new type radial relieving attachment. The flute face is used to generate any amount of radial relief or combination or radial and axial relief. The attachment is ideal for cemented carbide tools. Spati Industries, Inc., P. O. Box 501, Covington, Ky., will provide copies of a circular containing information on the attachment, or—**Circle Inform-A-Gram No. B50.**

Wet Collection of Industrial Dusts is performed by the Ventrijet dust collector. A bulletin contains 15 photos and drawings showing the unique action of this dust collector. Dimensions, weights and capacities are presented in three tables. Bulletin 920 with details is available from Pangborn Corp., Hagerstown, Md., or—**Circle Inform-A-Gram No. B51.**

Special Machinery is featured in Catalog SMD-56 issued by Kearney & Trecker Corp., Milwaukee 14. Among the production machine tools described complete with production data are standard machines with special fixtures or heads and with special tooling. Also detailed are machines designed for specific requirements.
Circle Inform-A-Gram No. B52.

A Line of Metal Abrasives is featured in 18-page Catalog 556 published by The Cleveland Metal Abrasive Co., 800 E. 67th St., Cleveland. The various types of shot and grit in the 20th Century line are described and illustrated complete with technical data. Included are specifications and a discussion of the types of cleaning and peening methods.
Circle Inform-A-Gram No. B53.

Dressing Grinding Wheels by airless abrasive blasting during manufacture is the subject of Bulletin 121-D published by Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind. A case history is discussed and the advantages listed.
Circle Inform-A-Gram No. B54.

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LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS
CIRCLE INFORM-A-GRAM KEY NO. 137

Rolling Steel Rings is explained in simplified form in a bulletin from Edgewater Steel Co., Pittsburgh 30. The rolled steel rings are formed from solid blocks of steel in diameters from 5" to 180". Ribs, flanges, grooves, conical and tapered surfaces, etc. are formed during the rolling, minimizing the need for further finishing operations.
Circle Inform-A-Gram No. B55.

Save Time by eliminating mechanical clamping on production machining with Power-Grip chucks. A bulletin gives the facts about the chucks and tells how they hold for heavy cuts. Also included are the details on general grinding operations and technical data. Form MC-2 is made available by Sundstrand Machine Tool Co., Rockford, Ill., or **Circle Inform-A-Gram No. B56.**

Solid Tungsten Carbide Pusher Pads are now available from Benco Collet Mfg. Co., Cleveland 14. These pads are designed to fit standard Model "A" Master Pusher produced by the company. For details, see Price List 156-CP issued by the company, or — **Circle No. B57.**

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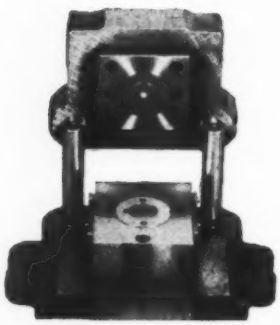

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CIRCLE INFORM-A-GRAM KEY NO. 138

Barrel Finishing Equipment and Supplies are highlighted in a new 52-page general catalog published by Almco Div'n, Queen Stove Works, Inc., Albert Lea, Minn. One section of the catalog is devoted to an explanation of barrel finishing and the

variables involved. Other sections cover the types and uses of Supersheen media and finishing compounds and the various types of Supersheen barrel finishing machines and accessory equipment.
Circle Inform-A-Gram No. B58.

Surface Grinders, both hydraulic and hand feed, are the subject of a bulletin from Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill. These machines featuring an 18" x 6" table working surface, have a 7¼" cross feed travel. The heavy duty spindle accommodates 8" x ⅝" or 8" x ¾" grinding wheels. The machines are designed and built for the toolroom as well as for production use. **Circle Inform-A-Gram No. B59.**

Construction Details of Steelweld Press Brakes are described and illustrated in a revised catalog. Dimensions and specifications are given for the entire standard line of press brakes which range in bending capacity to 14' x ¾" mild steel. Direct requests for Catalog 2010-J to The Cleveland Crane & Engineering Co., Wickliffe, O., or —
Circle Inform-A-Gram No. B60.

The Principles of Unitized Dust Collection, its advantages and savings are described in "You Can Solve That Dusty Cost Problem." The booklet illustrated with cartoons, cutaways and production photos, covers dust damage and general product information. For your copy of Booklet 56, contact Dept. KP, Torit Mfg. Co., 292 Walnut St., St. Paul 2, Minn., or —
Circle Inform-A-Gram No. B61.

Can End and Closure Making Machinery for medium and high speed can lines is described in a new catalog. Included are design and construction features and dimensions for an automatic high-speed strip press capable of 300 strokes/min, high and medium speed strip feed presses and curling and stacking machines. Copies of Sec. 2, Catalog 36-B can be obtained by writing to E. W. Bliss Co., 50 Church St., New York 7, or —
Circle Inform-A-Gram No. B62.

A Line of Metalworking Machinery is highlighted in Bulletin 5501 from Oliver Machinery Co., Grand Rapids 2, Mich. The metal cutting band saws cut ferrous and non-ferrous metals and plastics accurately and smoothly. Cutting, slotting or milling of non-ferrous metals, melamie and similar materials is handled by saw tables. Also included are grinding and polishing machines and spinning lathes.
Circle Inform-A-Gram No. B63.

"Materials in Motion" describes the Kennett line of materials handling receptacles. They are designed to increase efficiency, reduce costs and simplify methods for handling raw materials, components and finished products. The booklet illustrates a few typical installations and shows the available models. National Vulcanized Fibre Co., Wilmington 99, Del., will provide copies of the booklet, or —
Circle Inform-A-Gram No. B64.

Handle All Lathe Operations with one all purpose Elk toolholder which performs the work of 10 single purpose toolholders. Both broached and duplex types are available which are ideal for use with carbide tools. In addition to giving prices, sizes and details, a bulletin covers boring bars and threading tools, and Super X cobalt bits. Get your copy from Acme Tool Co., 71 W. Broadway, New York 7, or —
Circle Inform-A-Gram No. B65.

Positive Locking, Denser Castings, less down time and longer life are features of the Wedgelock die casting machine. A bulletin contains an illustration showing the design details and construction of the machine. Also listed are the machine's advantages and the specifications of the available models. Obtain your copy of the bulletin from Cuyahoga Industries, 17920 Waterloo Rd., Cleveland 19, or —
Circle Inform-A-Gram No. B66.

6 Special Ways to Air Gage for Lower Costs and Higher Production are pointed out in a folder published by The Taft-Peirce Mfg. Co., Woonsocket, R. I. The folder deals with automatic gaging as applied to mass production automation operations and shows semi-automatic and manual applications where air gaging can be used to advantage.
Circle Inform-A-Gram No. B67.

2000 Psi Service is furnished by Class 4 hydraulic cylinders. A catalog contains detailed engineering and dimensional data. Features and parts cross-sections, mounting brackets, rod clevises and special cylinders are also included. Get your copy of Catalog 104 from Galland-Henning, NOPAK Div'n, 2782 S. 31st St., Milwaukee 46, or —
Circle Inform-A-Gram No. B68.

The 618 Hand Feed Precision Surface Grinder is highlighted in an 8-page catalog available from Abrasive Machine Tool Co., East Providence, R. I. Illustrated and described are the many features and operational advantages engineered into the new surface grinder.
Circle Inform-A-Gram No. B69.

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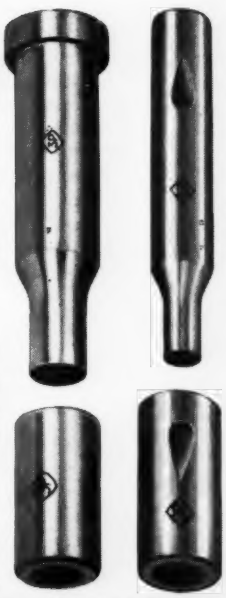

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CIRCLE INFORM-A-GRAM KEY NO. 139

Maintain True Machine Level with a precision aligning level produced by The Bullard Co., Bridgeport 9, Conn. Higher speeds combined with increased cutting loads tend toward excessive wear unless equipment is precisely level and aligned. The levels are made in two sizes, 18" and 27". For details, get a circular from the company, or — **Circle Inform-A-Gram No. B70.**

Dynamic Unbalance is explained and the effects of dynamic unbalancing are listed in a catalog released by Bear Mfg. Co., Rock Island, Ill. The catalog presents the company's line of Dy-Namic balancing machines, complete with specifications and illustrations. Also included are photos showing the machine in action and general ordering information. **Circle Inform-A-Gram No. B71.**

Specifications and Capacities for the G-V metal worker, Model 285B, are found in a circular from Tech-Pacific, 2811 Lafayette, Newport Beach, Calif. This universal sheet steel and plate working machine will handle straight, circle and figure cutting, heading, folding, nibbling, etc. operations. **Circle No. B72.**

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solid carbide drill bushings
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fully interchangeable with Standard Steel Bushings
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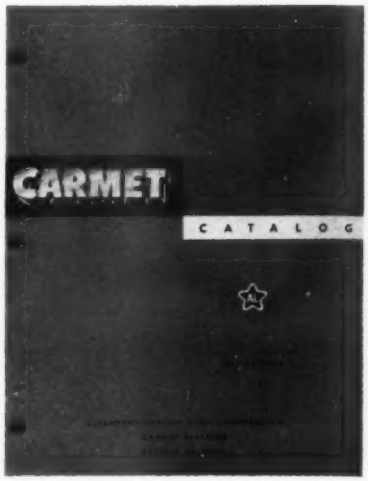
MACHINE PRODUCTS INC.
Plant and General Offices: Bridgeport, Michigan
Sales Offices in all Principal Cities
CIRCLE INFORM-A-GRAM KEY NO. 140

A Complete Line of Carmet steel cutting carbides, CA-600 Series, is presented in a catalog supplied by Allegheny Ludlum Steel Corp., Carmet Div'n, Detroit 20. Included are suggested grades for general operations and methods for ordering special Carmet parts. Covered are cutting tool grades; standard, insert, throw-away and special blanks; standard tools; tool and die making with carbide; die sections and punches; die inserts; and piercing punches and bushings. **Circle Inform-A-Gram No. B73.**



Designed for Light to Moderate Cuts at exceptional high speeds on steel, cast iron and non-metallics is a new aluminum oxide base cutting tool material. Seramet is available in triangular and square throw-away inserts for negative rake toolholders. Details are found in Bulletin 56-2 released by Vascoloy-Ramet Corp., Waukegan, Ill., or — **Circle Inform-A-Gram No. B74.**

Punches, Shears, Bending Brakes, power presses and shears, foot presses and shears and dies and small tools are included in a catalog of metalworking tools and machinery. Each item is pictured, its specifications given and the applications listed. Catalog 1956 is available on request to Whitney Metal Tool Co., Rockford, Ill., or — **Circle Inform-A-Gram No. B75.**

Perforate Materials Up To and Including ⅛" Mild Steel with Whistler adjustable perforating dies. They can be used for single perforations on the smallest press to complex arrangements for large press brakes. Catalog 55 with stock sizes, shapes and applications of the perforating dies is available from S. B. Whistler & Sons, Inc., 748 Military Rd., Buffalo 23, or — **Circle No. B76.**

Two Recent Developments in precision measurement are described in a new bulletin. Given is information on the Em-re 0.00005" dial indicator with an explanation of how it provides readings to a 0.00001" accuracy. Also covered is the Master dial indicator checker. Petz-Emery Inc., Pleasant Valley, N. Y., will provide copies of Bulletin 656, or —
Circle Inform-A-Gram No. B77.

Welded Stainless Steel Pipe and Tubing are featured in a bulletin from The Standard Tube Co., 24450 Plymouth Rd., Detroit 39. The pipe and tubing are produced in a wide range of sizes and grades to solve tough corrosion and temperature problems. The tubing is available in round, square, rectangular and special shapes. Also covered in the bulletin is pressure tubing.
Circle Inform-A-Gram No. B78.

Cut Faster and Easier with Aber curved tooth milling cutters. The patented curved-tooth principle provides perfect shearing action instead of the usual digging or scraping. These cutters provide more accurate control of limits and finish. An illustrated catalog giving complete ordering information and descriptions is supplied by Aber Engineering Works, Inc., Waterford, Wis., or —
Circle Inform-A-Gram No. B79.

A Complete Line of Ful-Grip Q-D, standard Multi-V and special sheaves is presented in Catalog MVD-56 released by Maurey Mfg. Corp., 2915 S. Wabash Ave., Chicago 16. Included is information on the handling of sheaves, dimensions, descriptions, illustrations and charts. Also given is data on Mor-Grip V-belts and Hi-Q V-pulleys for FHP V-drives.
Circle Inform-A-Gram No. B80.

Three Models of Portable Lifts are illustrated and described in a new catalog sheet. In addition, the literature contains numerous operating shots and photos of their various applications. Detailed are Models L1112-P, L2056-P and L542. Copies of the catalog sheet can be obtained from The Oster Mfg. Co., Box 4326, Cleveland 32, or — **Circle No. B81.**

Two-Position Discrete Operations of starters, pumps, valves, loaders, etc. is handled by a plug-in package remote control system. The system can be used with existing equipment or controls. A brochure describing the system and techniques is available from Sparton Control Systems Div'n, The Sparks-Withington Co., Jackson, Mich., or — **Circle No. B82.**

Rapidly Grind Large Diameter, Short Parts with the 42" Hi-Swing semi-automatic chucking grinder. It is particularly suited for parts requiring external and internal operations. The grinder's features, operation and auxiliary equipment are detailed in Catalog 1780-1 issued by Norton Co., Worcester 6, Mass., or —
Circle Inform-A-Gram No. B83.

Eliminate the Distorting, Twisting Action of Conventional Clamps with Kant-twist clamps. They provide three different gripping surfaces. Copies of a catalog sheet covering Kant-twist clamps and Quick Acting fixture clamps can be requested from Saxton Mfg. Co., Inc., 1517 N. Potrero Ave., El Monte, Calif., or —
Circle Inform-A-Gram No. B84.

Fasteners Designed for Projection Welding are highlighted in a bulletin from The National Screw & Mfg. Co., 2440 E. 75th St., Cleveland 4. Covered are both standard and special fasteners. Shown complete with dimensions are types of welding screws, welding pins and nuts and projection Weldnuts.
Circle Inform-A-Gram No. B85.

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Brookfield Tool Holders

Patented features provide ease, speed, economy

Proved in four years of industrial use! Only the original Brookfield V-Jaw, adjustable tool holders provide these unmatched advantages:

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CIRCLE INFORM-A-GRAM KEY NO. 141

"Go" and "Not Go" Reversible Plug Gages are featured in Circular 595 put out by Pratt & Whitney Co., Inc., Charter Oak Blvd., W. Hartford, Conn. These gages are available as cylindrical or thread gages made to American gage design standards. The circular lists standard sizes and specifications for cylindrical and thread gages and collet bushings. **Circle Inform-A-Gram No. B86.**

Installation Accessories for lubrication, hydraulic, steam, liquid and air applications are covered in Catalog 17-E released by J. N. Fauver Co., Inc., 51 W. Hancock, Detroit 1. Included are specifications and prices on adapters, couplings, wings, ells, tubing, swivels, etc. Also given is a table for determining pipe threads. **Circle Inform-A-Gram No. B87.**

Faster Cutting, Longer Tool Life and better finishes are assured with Ford cutting tools. They hold tolerances as close as 0.0002" on precision grinding equipment. H.S.S. and carbide rotary cutters, countersinks, carbide end mills and special tools are covered in Catalog 601 released by M. A. Ford Mfg. Co., Inc., Davenport, Iowa, or — **Circle No. B88.**

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Drill Jig Bushings

For your convenience, Ex-Cell-O maintains huge stocks of precision Drill Jig Bushings, and efficient expediting facilities which make possible "same day" shipment. This means orders are filled and dispatched from complete inventories in New York, Detroit, Los Angeles and London, Ontario, within a few hours after they are received!

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56-13

1. Headless Press Fit Bushings. 2. Head Liners. 3. Fixed Renewable Bushings. 4. Slip Renewable Bushings. 5. Headless Liners. 6. Head Press Fit Bushings.

CIRCLE INFORM-A-GRAM KEY NO. 142

A Complete Line of Throwaway Holders and Tips is covered in a catalog issued by Valenite Metals Corp., Box 205, Royal Oak, Mich. Listed are the new features which

include combining a variety of standard elements to make up semi-specialized tooling to fit individual jobs. Four different clamping arrangements are offered and each holder can use any one of three tip thicknesses. **Circle No. B89.**

Suitable for 150 Psi Air or Hydraulic Use are Vi-Speed cylinders. These standard cylinders have built-in universal mountings for foot or tie rod flange mounting both ends. They are entirely non-corrosive and dent resistant. A bulletin covering stacked cylinders and giving mounting data and specifications for the standard cylinders is issued by Van Products Co., Erie 7, Pa., or — **Circle Inform-A-Gram No. B90.**

Accurate to 0.000001" is Model 212 Link Fringecount micrometer. It is used in the laboratory to check gage blocks, plug gages and other secondary standards and as a standard production testing instrument to check outside dimensions, length, thickness or any other external measurements. For details on the micrometer, obtain Bulletin LP-3521 from Link Aviation, Inc., Hillcrest, Binghamton, N. Y., or — **Circle Inform-A-Gram No. B91.**

Spiroid Gears for medium to high reduction ratios are presented in a bulletin published by Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39. These gears have three to four more teeth in contact than other skew-axis gears and permit outstanding weight and space economy in speed reducer design. The illustrated bulletin gives complete details. **Circle Inform-A-Gram No. B92.**

GROWING PAINS

Five thousand sq ft of production and office space has been added to the plant of **Tri-Point Manufacturing & Developing Company.** The new space will be occupied primarily by automatic production equipment. The company specializes in the machining of plastics and fabrication of precision electronic and other assemblies.

◆

A $3,000,000 electrical equipment plant is being built by **Square D Company** in Lexington, Ky. One-third of the amount will be used for equipping the 150,000-sq-ft facility with the most modern, high-production machinery. The company has also leased a 12,500-sq-ft building in the same city for the assembly of special panelboards and switchboards.

◆

A new 1,500,000 sq ft car and truck assembly plant will be built by **Ford Motor Company** near Lorain, Ohio. When completed in 1958, the plant's capacity, if operated on two shifts, will be 960 vehicles daily.

◆

A new plant in Quincy, Ill., for the production of LPG tanks was put into operation by **Master Tank & Welding Company.** There are 15,000 sq ft of manufacturing space in addition to an adjacent office building.

◆

Rockwell Manufacturing Company plans to occupy a new 180,000-sq-ft valve manufacturing plant at Kearney, Neb. The facility which will be completed next year, will cost approximately two million dollars and will be used for machining, assembly and testing of Rockwell-Nordstrom Hypreseal valves.

◆

Plans for the construction of a multimillion-dollar distribution transformer plant in Athens, Ga., have been disclosed by **Westinghouse Electric Corporation.** This facility will double the output of the transformer division in Sharon, Pa., of which it is a part.

◆

The first of five new titanium melting furnaces is now in operation at **Mallory-Sharon Titanium Corporation** in Niles, Ohio. This is a major step in the company's $4.5-million expansion program which will double present capacity by 1957. The latest expansion involves 130,000 sq ft of floor space in five buildings and enlargement of research, engineering and quality control facilities.

Construction of a factory addition that will increase manufacturing space by over 50% has been begun by **The Planet Corporation.** The firm designs, fabricates and installs engineered materials handling systems.

◆

The Cincinnati Shaper Company is building additional facilities at its Whitewater Shop in Hamilton County, Ohio. This building when completed in 1958, will add approximately 180,000 sq ft. The company will then consolidate all its operations at the Whitewater location.

A 1,200-acre tract of land near Latrobe, Pa., has been purchased by **Kennametal Inc.** for the expansion of manufacturing facilities and to permit further decentralization to minimize damage from floods. This installation will provide about 25,000 sq ft of floor space which will be used for grinding and finishing special or custom-fabricated carbide products.

◆

American Stamping Company, one of the nation's biggest independent producers of metal stampings, is building a 10,800-sq-ft addition to its Euclid, Ohio, plant.

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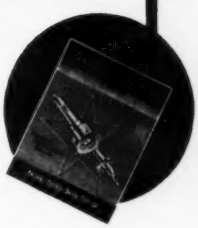
FOR MULTIPLE OPERATIONS

A P.D.Q. (Portage Double Quick) Holder and Tool Adapter in one or more stations means an extra turret station or *unlimited* stations . . . depending on the number of operations. Just a slight turn of the lock nut releases the holder and you're set for a new tool and new operation . . . all in a matter of seconds. The new P.D.Q. method of tooling can cut costs to a fraction of former out-dated methods. Send for literature concerning complete information on THE NEWEST AND MOST MODERN TOOLING ADVANCEMENT IN INDUSTRY.



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CIRCLE INFORM-A-GRAM KEY NO. 143

MEN YOU SHOULD KNOW

Peter C. Prior is serving as treasurer and general manager of Smith-Armstrong Forge, Inc. In this new capacity, Mr. Prior is heading an expansion program to modernize and increase forging and machining facilities to supply high speed steel forgings to nationwide users.

◆

Kenneth R. Fisher is the new president of Super Tool Co., Detroit subsidiary of Van Norman Industries, Inc. He has been connected with the company for eight years.

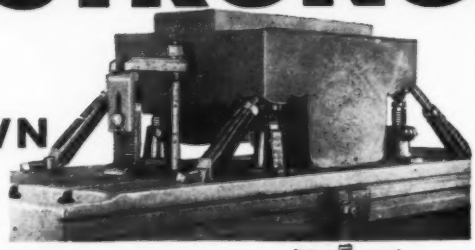
O. J. Skawden has been named vice president of Sutton Engineering Co. With the firm since 1927, Mr. Skawden will continue as chief engineer at the firm's Bellefonte, Pa., plant.

◆

Edward J. Eggart has been elected president of Vinco Corp. He succeeds **E. E. Butler** who has become chairman of the board of directors. Mr. Eggart was also named to the board of directors.

ARMSTRONG

SET-UP and HOLD-DOWN TOOLS



ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and previent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

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"The Tool Holder People"
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T-SLOT CLAMP

NON-SKID JACKS

STEP BLOCK

UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS

STRAP CLAMPS

CIRCLE INFORM-A-GRAM KEY NO. 144

M. C. Patterson has been appointed president of Dodge Division of Chrysler Corp. He has been associated with Dodge for more than 35 years. Mr. Patterson succeeds **William C. Newberg** who has been assigned to the newly-created post of group vice president-automotive to supervise all the corporation's vehicle divisions and the MoPar Division. **George H. Stover** is the new manufacturing manager-car operations. He is responsible for all manufacturing operations, including production, planning, traffic, quality control, industrial engineering and plant protection activities. **Robert L. Jenkins** has been promoted to general superintendent-car manufacturing and **Richard A. Vining,** to production engineering manager.

◆

Scovill Mfg. Co. has disclosed two appointments in the newly formed Forging and Screw Machine Division. **W. H. Machin** has taken over as manager and **N. J. Schaffer** as factory superintendent of the division. The appointment of **Hooker Stoughton** as manager of the aircraft fastener section of the Closure Division has also been announced. Mr. Stoughton will be responsible for research, product development, production and marketing of Paneloc aircraft fasteners.

◆

Herbert Geittman, Jr. has been put in charge of the development effort on castings for the machine tool industry by Climax Molybdenum Co. He will be located at the company's Detroit office.

◆

The election of **Robert Graves Hess** as executive vice president of Walworth Co. has been announced by **Fred W. Belz,** president. Prior to joining the company, he was executive vice president of Pesco Products Division of Borg-Warner Corp.

◆

Herman H. Flaum has been made superintendent of cold and hot header operations at the two Cleveland plants of The Cleveland Cap Screw Co. He has been with the company for more than 20 years.

◆

Latrobe Steel Co. has announced the promotion of **David P. Hughes** to the position of chief metallurgical engineer. In his new position, Mr. Hughes is responsible for all activities of the Metallurgical Laboratory directly related to sales.

◆

The new vice president and general manager of Western Brass Mills Division of Olin Mathieson Chemical Corp., is **J. E. Williams.** He will make his headquarters at East Alton, Ill., and will also direct the company's Brass Mills operations at New Haven.

MEN YOU SHOULD KNOW

The Taft-Peirce Mfg. Co. has announced the appointment of **Kenneth H. Williamson** as superintendent of the Contract Service Division. Mr. Williamson succeeds **Gustav A. Hoberg** who died recently. **Russell W. Grabinsky** has been named superintendent of the Small Tool and Gage Division. He has been acting superintendent since the death of **J. Harold Smith** early this year.

◆

Roger K. Furse has joined Universal-Cyclops Steel Corp. as superintendent of the company's cold finishing department.

◆

The new vice president in charge of manufacturing of The Colson Corp. is **Jack J. Begley.**

◆

Lawrence L. Garber has stepped into the newly created position of vice president in charge of production for H. K. Porter Co., Inc. He is supervising production for the firm's 13 divisions. **Eugene Salinger** has become general manager of the Henry Disston Division, succeeding Mr. Garber.

◆

James F. Bere has taken over as general manager of Axelson Mfg. Co,. division of U. S. Industries, Inc. He will be succeeded as general manager of the Hamilton, Ohio, plant of Clearing Machine Corp., another of the corporation's divisions, by **Howard W. Carlisle.**

◆

The appointment of **John Wallerius** as chief engineer of Lindberg Industrial Corp. has been announced by **Lawrence H. Remiker,** company president. In addition to directing activities of an expanded engineering department, Mr. Wallerius will be responsible for the supervision of important phases in the design, manufacturing and field-erected installations of the company's line of large-custom-built heat treating, melting and production line processing equipment.

◆

Earl F. Harris has been elected president of Rodney Hunt Machine Co. He joined the firm in 1946.

◆

Three major appointments in the Axle Division of Clark Equipment Co. have been announced by **Claud Fenn,** vice president. They are **L. M. Gray,** chief engineer; **G. C. Vanderberg,** engineering consultant; and **William E. White,** new development engineer.

◆

Aaron E. Wilcox has become master mechanic at Modern Industrial Engineering Co. Prior to joining Modern Industrial, he was with Packard.

The new president and general manager of The Oster Mfg. Co. is **T. S. Bonnema.** He has been associated with the company since 1922. **Roger Tewksbury** who has been president of the company since 1937, has been named chairman of the board.

◆

J. E. Harling has taken over as operations manager in charge of manufacturing and purchasing activities for both the Pasadena and Los Angeles facilities of Air Logistics Corp.

W. W. Higgins has been appointed chief engineer of A. O. Smith Corp. He had been director of engineering at the firm's Permaglas Division. Mr. Higgins, who joined the company in 1930, has had extensive experience in the development of glass coated steel used in eight of the firm's 20 product lines.

◆

J. Davidge Warfield has joined Morse Chain Co. as administrative assistant to the president.

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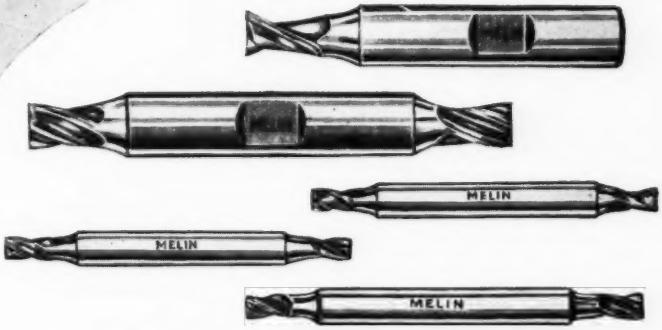
with flutes shorter than regular

Offer GREATER STRENGTH...*

TWO, THREE AND FOUR FLUTE



...★ *Plus an Exclusive*... In addition to manufacturing a *complete* line of End Mills, the Melin Tool Company makes several standard *Stub Length Mills* exclusive of other tool manufacturers.

The new Melin Tool Catalog No. 54-C lists the specifications on these *all inclusive* Stub Length Tools... and... they offer greater strength and less breakage. Write for your catalog... today.

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3371 West 140th Street
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CIRCLE INFORM-A-GRAM KEY NO. 145

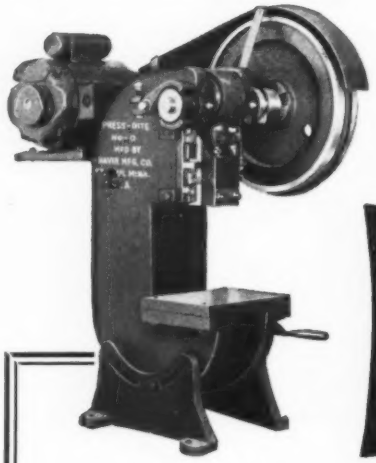
• *New Equipment*
• *New Materials*
• *New Literature*

WHAT'S NEW

Designed for Pneumatic Operations at working pressure up to 125 psi is Type H-52 plastic hose. This industrial hose has a smooth bore which permits greater flow, allowing a smaller I.D. hose than normally can be used. Get a bulletin showing the various sizes and fittings for the hoses from Hofmann Engineering Co., 5601 S. Crawford Ave., Chicago 29, or — **Circle No. E1.**

"Why Plastic Tooling?" tells how tooling compounds based on Bakelite epoxy resins can cut production costs and simplify model changeovers. The compounds provide inexpensive jigs and fixtures, forms, patterns and dies. The mailer listing 39 applications is made available by Bakelite Co., Div'n of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, or —
Circle Inform-A-Gram No. E2.

STILL THE LEADER IN ITS CLASS!



Model O 5-Ton Press-Rite

5 TON PRESS-RITE POWER PRESSES

Compare Feature for Feature

. . . the features you'd expect to find only in the larger presses!

THEN COMPARE PRICE

$2670.00

(FOB St. Paul, Minnesota less motor & belt guard)

- **Special High-Strength Frame** with reinforcing ribs at all vital points.
  —Reduces die-wearing deflection.
  —Increases Production between die grinds.
  —Gives 2 to 3 times longer die life!
- **Special Bronze-Bushed Flywheel.**
- **Bronze Bearings** in both the main bearings and connecting rod.
- **Bronze Wear Plate** on back of ramways.
- **Greatest Shut Height** for their size! Permits using larger, more bulky dies.
- **Adjustable Ram Gibs** for more precise alignment.
- **Open Back, Inclinable.**
- **Single Stroke Safety** (may be quickly arranged for continuous operation).

10 MODELS: 2-Ton, 5-Ton, 10-Ton, 15-Ton, 20-Ton, 30-Ton, 37-Ton, 45-Ton, 60-Ton, and 85-Ton.

Yes, Press-Rite Power Presses are built-for-the-job. Save money in your plant, switch to PRESS-RITE . . . Top buy in the field!

Write Today for Bulletin 955 and Name of your Local Distributor

PRESS-RITE DIVISION
SALES SERVICE MACHINE TOOL CO., 2351 University Ave., St. Paul W14, Minn.

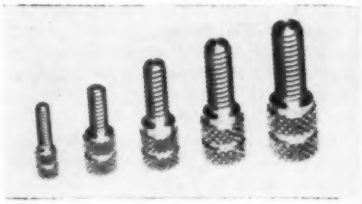
Used by more . . . for more production

PRESS-RITE

OPEN BACK • INCLINABLE *Power Presses*

CIRCLE INFORM-A-GRAM KEY NO. 146

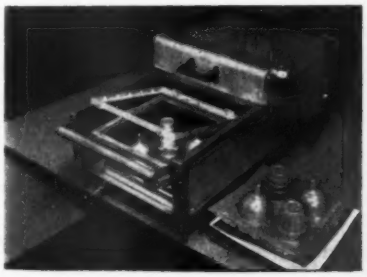
Threaded Studs for molding in plastics, rubber, die castings or potting compounds have been added to the threaded insert line manufactured by Standard Insert Co., 12270 Montague St., Pacoima, Calif. These studs which are made with a knurled head to prevent rotation in use, are



designed to be molded into the product at the time of fabrication. They are made in all regular thread sizes from No. 2 to ⅜" for both NC and NF threads. Standard material is brass, but studs can be made to order from steel, aluminum or stainless.
Circle Inform-A-Gram No. E3.

A New Foamed Plastic for a variety of applications is detailed in a booklet from Nopco Chemical Co., Harrison, N. J. Included is data on the chemical nature and the basic properties of Lockfoams. Also covered are the advantages and applications of Lockfoams. In the back pocket of the booklet is a standard product list and list description.
Circle Inform-A-Gram No. E4.

Make Sample Formed Parts or market test Skin-Pak packages with this small vacuum forming machine. The Lab-Vac has a maximum form-



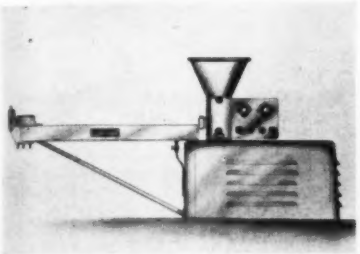
ing area 16" x 16". All thermoplastic sheet materials can be used. The Auto-Vac Co., 1986 State St. Ext., Bridgeport 5, Conn., or — **No. E5.**

Epocast 150 to 156 Epoxy Pastes are used for making tools and fixtures, among other things. They contain no volatile matter and have little shrinkage. These epoxy pastes are high in strength and capable of curing at room temperature. For details on Epocast 150 to 156, see Bulletin EP-56-7 issued by Furane Plastics, 4516 Brazil St., Los Angeles 39, or—**Circle Inform-A-Gram No. E6.**

IN PLASTICS?

• *Plastics Fabrication*
• *Plastic Tooling*
• *Plastics Molding*

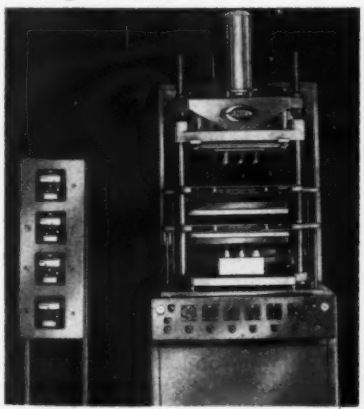
A Self-Contained Bench Model Vertical Extruder has been introduced by Reed-Prentice Corp., Worcester 4, Mass. Plasticizing material in a small area on the Autoflow 20V is an advantage in extruding vinyl and other heat-sensitive



thermoplastics. Fast through-put also helps product uniformity and quality. The extruder can be operated by plugging it into a lamp outlet. The Autoflow 20V needs only 1 hp motor to extrude 20 lbs of thermoplastic material/hr.
Circle Inform-A-Gram No. E7.

An Aico Plastics Applicator for easy selection of proper plastic materials is being offered by American Insulator Corp., New Freedom, Pa. An arrow is dialed to the physical property of greatest importance and the three most suitable materials will appear in the window in the order of their desirability. Also given is data such as specific gravity; tensile, compressive, flexural and impact strengths; power factor and arc resistance.
Circle Inform-A-Gram No. E8.

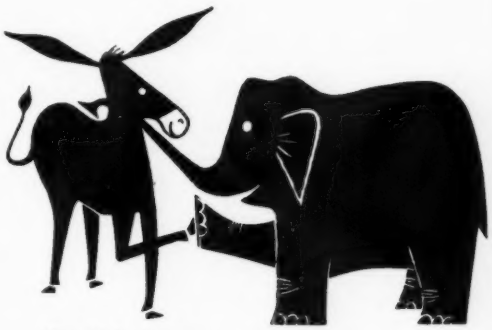
Form and Trim Thermoplastic Sheet in one operation with this vacuum forming machine. This unit is capable of vacuum, drape and plug forming. Maximum mold area is



24" x 24". Features include cutting dies (top) and sandwich heating units (center). Control is manual or automatic cycle. Vacuum Forming Corp., 76 S. Bayles Ave., Port Washington, N. Y., or—**Circle No. E9.**

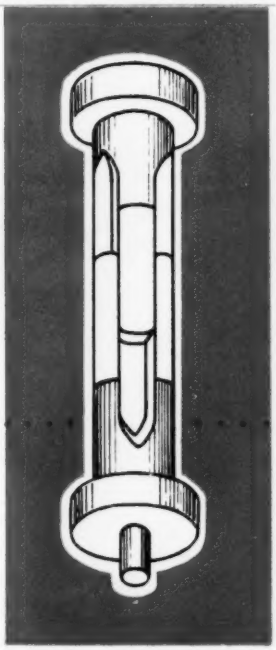
Zone Control of Die and Adapter Temperatures is accomplished by the Wheelco proportioning stepless controller. Model 400 Series Capacitrols are self-contained, indicating controllers which are adapted to control requirements of injection molding and extruding machines. Barber-Colman Co., Wheelco Instruments Div'n, Dept. D, 1517 Rock St., Rockford, Ill., or —
Circle Inform-A-Gram No. E10.

Increased Production Capacities are a feature of Model 616-L-12 plastics injection molding machine. It dry cycles 360 times/hr, molds up to 20 cu in/shot and accommodates molds 14½" x 24". The press provides injection pressures up to 21,000 psi. Details are in Bulletin 105 provided by Lewis Welding & Engineering Corp., 22966 St. Clair Ave., Cleveland 17, or —
Circle Inform-A-Gram No. E11.



On this issue

we're in complete agreement . . .



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With Intermeshing Sleeves

punch holes easier, faster, and accurately in SOFT or HARD, THICK or THIN materials. It's a trouble free operation because it provides positive alignment, closer clearances, cleaner burr-free holes. You get longer life because the punch is supported its entire length by the Intermeshing Sleeve.

All Durable Punches are Vertically Lapped, then Electrocoted. Makes stripping easier, eliminates galling and reduces PRESS DOWNTIME.

Because you are cost conscious, and we are too, we can give you the economical answer to your punching problems. You'll get a fast, practical reply from the most DEPENDABLE Punch and Die Manufacturer in the World, DURABLE, a company with two decades of punching know-how.

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DURABLE PUNCH & DIE COMPANY
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has been done with the SCLEROSCOPE
Since 1907

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Done to your specifications
We Have
21 Jig Borers
KIDDE PRECISION TOOL CORPORATION
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No. 25.	The Distribution of Air . . . from Source to Use.	_____	@ 20c		_____
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			Total	$	_____

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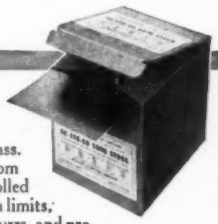
ARBOR SPACERS SHIMS and SPACING COLLARS • Arbor Spacers and Shims in 20 sizes and thicknesses from .001″ to .125″. Arbor Spacers furnished with standard keyway; Shims, with no keyway. Also Spacing Collars in numerous popular diameters, and in thicknesses from ⅛″ to 3″. Hardened and ground; edges chamfered. Furnished with standard keyway.

FEELER STOCK • Made from tempered stock, rolled to close tolerances, ½″ x 25′ coils packaged in transparent plastic boxes, except above .020″. Strips ½″ x 12″, in cellophane. 27 thicknesses. All thicknesses from .001″ to .032″. (For use in precision fitting, checking clearances, inspection and production work.)



SHIM STOCK • Steel or brass. Selected from material rolled to precision limits, free from burrs, and protected by oil coating. Coils packed in carton for easy dispensing and protection. 15 thicknesses, .001″ to .032″. Sheets 6″ x 12″; coils 6″ x 120″. Available also in two assortment packages —12 thicknesses, .001″ to .015″, and 15 thicknesses, .001″ to .032″.

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DETROIT STAMPING CO.
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CIRCLE INFORM-A-GRAM KEY NO. 1483

Cast Steel Grit Produces Lustrous Etched Finishes

Steel grit blast cleaning abrasive, used for etching non-ferrous work and producing lustrous finishes, also shows a saving in cleaning parts through a reduction in abrasive consumption.

This is due to the fact that cast steel abrasives, although having high hardness, can possess the ability to resist rapid breakdown. They wear down rather than chip away on impact, so they have longer useful lives.

A typical experience with steel grit abrasives is that of W. E. Foreman Co., a jobbing foundry, producing brass and aluminum sand castings. Steeletts grit, size GL-50, a product of Wheelabrator Corporation of Mishawaka, Ind., was recommended for the size and character of castings produced.

Blast cleaning time averages 7 min/load, for brass. Blasting is done after grinding. The gates are then blasted separately for 2 min so that they are free of contamination for remelting in the electric furnace.

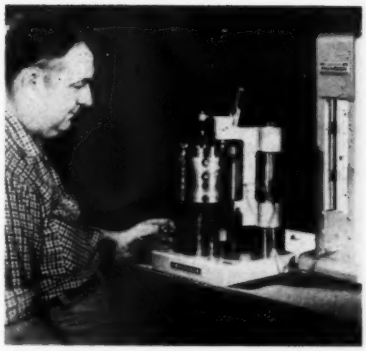
Air Gage Measures Bolt Stretch Under Tension

A unique Precisionaire gaging device for measuring how much a bolt stretches when tightened in an assembly has been developed by The Sheffield Corporation, Dayton 1, Ohio.

In the accompanying photograph, an aircraft accessory assembly is shown in bolt tightening and gaging position. When the operator tightens a bolt, the amount it lengthens is indicated by the position of the float in the gage at the right. Bolts are tightened and gaged individually. By bringing each bolt measurement to zero on the scale, the operator knows that all of the bolts are of equal tension.

The gage will accommodate variations in bolt length. A lever operated cam mechanism retracts the locating pin and gaging pin so that the part can be revolved to the next bolt without being raised.

The pivoted arm-type mechanism has a floating reference point at the top which contacts the head of the bolt. There is also a pneumatic Plunjet gaging cartridge at the bottom which is activated by the gaging pin that contacts the end of the bolt.



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Contour Gripping FIXTURE
SAVES YOU MONEY!
CUTS SPECIAL FIXTURE COSTS
INSTANTLY GRIPS AND HOLDS ANY ODD SHAPED PIECE
TAKE BIGGER CUTS
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HOLDS ANY SHAPE IN ANY POSITION
THOUSANDS OF USES
This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.
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WRITE for Further Information Today
Act Now!
AMPOGRIP CORP.
10G OLIVINE STREET,
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CIRCLE INFORM-A-GRAM KEY NO. 149

Robert A. Reese has been promoted to sales manager of the Syracuse district of Standard Pressed Steel Co. He replaces **Leonard H. Clark** who was recently named to the new post of assistant to vice president-sales. **Edward D. Otto** has been appointed a salesman in the same district.

The promotion of **George Bush** to sales division manager of the South Central Sales Division has been announced by Cleco Air Tool Division of Reed Roller Bit Co. Mr. Bush replaces **E. W. Clayton** who has become manager of sales development for Cleco.

◆

The position of senior sales engineer at Unique Equipment, Inc., has been filled by **Arthur Berlin.** He will stress the development and sales of positioning equipment and turning rolls applicable to the field of automation. Mr. Berlin is a veteran of 19 years in the automatic machinery field.

CIRCLE INFORM-A-GRAM KEY NO. 150

Leo M. Monroe has been appointed manager of industrial equipment sales for Brush Electronics Co. In his new post, Mr. Monroe will direct sales of the Brush Surfindicator and the recently introduced Metal Monitor.

◆

Donald O. Nelson is the West Coast factory representative for Diehl Mfg. Co. He handles the company's line of alternating current and direct current servomotors, tachomoters, and high accuracy resolvers.

◆

R. R. Stamm has become assistant sales manager of Superior Steel Products Corp. He has over 16 years experience in die and die set design.

◆

Ben A. Fleury, Jr. is the new assistant sales manager of Union Twist Drill Co. Headquartering in Athol, Mass., Mr. Fleury is responsible for and directing sales, advertising and distributor relations on the complete line of Union-Athol products.

◆

Chester S. Johns has been named to the newly created post of sales manager for standard machines and products of The Cross Co.

◆

Douglas C. Cunningham has joined Standard Gage Co., Inc. as sales manager. In this capacity, he will supervise branch offices and relations with manufacturers' representatives.

◆

Cleveland Instrument Co., Inc. has made known the appointment of **Fred Witzke** as manager of sales engineering and **Jack Kerrigan** as sales engineer.

◆

John M. Mele has been transferred to the New York City sales area of Bay Sate Abrasive Products Co. He formerly represented the company in the Cleveland area.

◆

The new sales manager of Morton Mfg. Co. is **Henry W. Kreifeldt.** He joined the company in 1935.

◆

C. A. Pafenbach recently took over as vice president in charge of sales for Lavallee & Ide.

◆

R. G. Tower will serve as manager of the newly opened western sales office of The Bristol Co. The office is located in Denver, Colo.

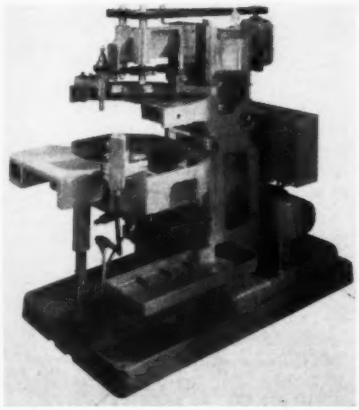
◆

The appointment of **Les Haisen** as manager of the new west Michigan branch of the Detroit regional sales office for industrial products has been disclosed by Vickers Inc. With headquarters in Grand Rapids, Mich., Mr. Haisen will be responsible for providing design, development and engineering assistance in the application of industrial and mobile oil-hydraulic systems in western Michigan and northeastern Indiana.

"DO-IT-YOURSELF" SPECIAL MACHINE PLAN OFFERED

Mass production of small metal parts and components usually calls for development of special machinery. But, even with the availability of well-equipped machine shops and toolrooms, special machine building projects frequently run into excessive costs and time losses in eliminating "bugs."

A new plan put forward by the Bodine Corporation, of Bridgeport, Connecticut, offers a solution. For many years, Bodine has been a major source for development of special machinery and tooling for mass production and assembly operations on small-to-medium-sized metal and plastic parts. Typical work cycles can include drilling, reaming, tapping, milling, screw-inserting and a wide variety of assembly operations. The Bodine basic machine has been refined down to a thoroughly proved "chassis," available in four sizes, which can be tooled for a practically unlimited range of work by the simple arrangement of standardized indexing, feed and spindle units.



The Bodine basic machine unit with front bracket removed to show spindle drive arrangement. A wide range of basic standard spindle units, standardized automatic feed methods and units, and interchangeable index tables or dials complete the tooling.

Bodine now offers these basic machines and tooling components either separately or in any desired combination to those who may wish partially or wholly to design and assemble their own "specials." As pointed out by Mr. E. F. Bodine, Vice President, "Any manufacturer will not only save money as compared with the purchase of separate indexing tables, feed mechanisms and other special components, he will also save himself headaches because these matched units can be put to work with minimum engineering and time loss."

There are two additional features of the basic machine design that will have special interest for tooling and production men. First, all operations are mechanically interlocked, eliminating complicated air feeds and electrical interlocks. Secondly, once the machines are built and in operation, they will be serviceable with standard inspected parts . . . off the shelf.

Basic units or other components sold under this new plan will be exactly the same in every respect as those used in complete Bodine engineered installations. In fact, purchasers of the units can use Bodine engineering service to any required degree in the development of their special machinery programs.

CIRCLE INFORM-A-GRAM KEY NO. 151

Cemented Oxide Tooling Improves Work Finishes

Stepped-up machine speeds, through the use of cemented oxide cutting tools in finish turning 31″ lathe spindles, recently enabled R. K. LeBlond Machine Tool Co., Cincinnati, to both improve work finishes and increase production over 100%.

The time cycle for all steps required to finish each spindle — minus loading time — was reduced to 2.8 min under actual production conditions. Under previous conditions with carbide as the cutting tool, the cut took 6 min. Currently, the work is being turned at 715 fpm.

The job at LeBlond calls for making a 12-step cut with only one cutting tool along 29″ of the 31″ spindle. The latter is 3½″ dia stepped down to 2⅜″ at the opposite end. The nose end of the spindle is not involved at this stage of machining.

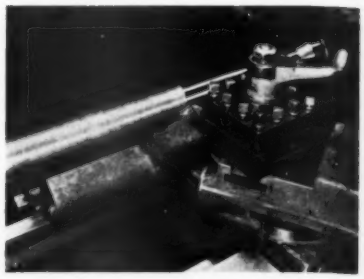


Fig. 1. Closeup of finish turning operation showing new Carboloy grade 0-30 cemented oxide tool cutting at 715 fpm. Twelve-step finish turning time on each spindle was reduced from 6 to 2.8 min.

Prior to finishing, the spindles are first roughed out on a 16″ tracer-controlled engine lathe to leave a depth of stock between 1/64″ to 1/32″. The finishing operation takes place on the same type of lathe after all spindles at hand are roughed out at a feed of 0.0125″.

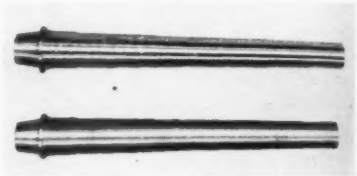
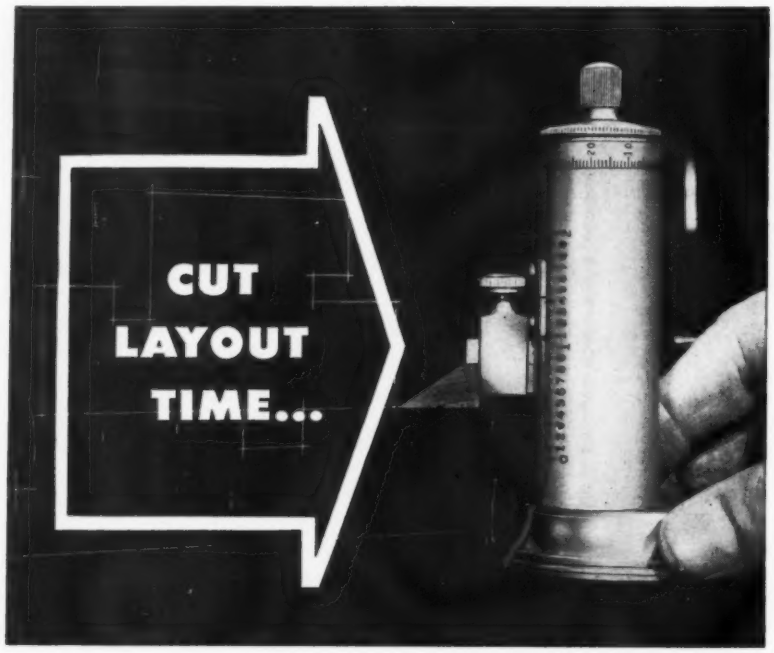


Fig. 2. Type of finish provided by the new grade 0-30 cemented oxide cutting tool is indicated by upper spindle. Same spindle is shown below in roughed-out condition. Note steps required.

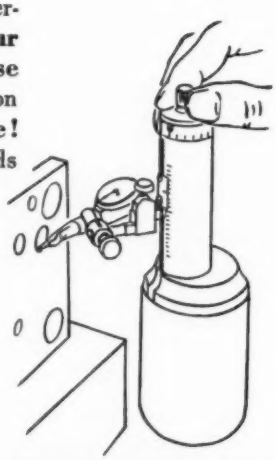
With carbide, the finishing operation was run at a machine speed of 350 fpm. Following a run of 20 spindles it was necessary to change the carbide tool for resharpening.

Application of the new Carboloy 0-30 cemented oxide tool with proper geometries boosted the machine output to 29 spindles before resharpening was necessary, finish turning each spindle in less than half the time. Size variation from spindle to spindle in each run of 29 varied only about 0.001″ without touching the setup.



with GREIST MICRO-HEIGHT® GAGE

Precision-built Micro-Height scribes like a vernier height gage... **reads faster than your micrometer!** You read direct from **zero at base** to 3″. Hundredths on barrel... thousandths on large-diameter head that **cuts reading time!** Precision ground and lapped Riser extends range to 9″.



CUT INSPECTION TIME!

Add your dial indicator to quickly read distances between holes, surfaces.

Precision-built, satin-chrome finished Micro-Height Gage quickly pays for itself!

Call your distributor or write.

THE GREIST MANUFACTURING COMPANY, 489 BLAKE STREET, NEW HAVEN 15, CONN.

Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 152

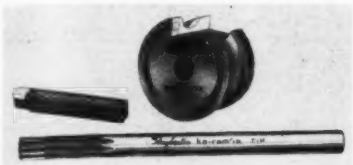
KNOW-HOW REPRINTS AND TECHNICAL BOOKS ARE NOW AVAILABLE SEE "HUEBNER PUBLICATIONS" ON THE ADVERTISER'S INDEX

Ceramic Cutting Tool Features Tip Bonded to Shank

A new type ceramic tipped cutting tool is being introduced to the metal-working industry under the trade name Keramik.

This new tool, developed by the Special Products Department of the Raybestos Division, Raybestos-Manhattan, Inc., is the first cutting tool to have the ceramic tip bonded to a steel shank instead of clamped in a holder.

When properly ground, this tool will produce a fine finish comparable to a commercial grind. In addition it will cut materials that most carbide-tipped tools cannot cut.



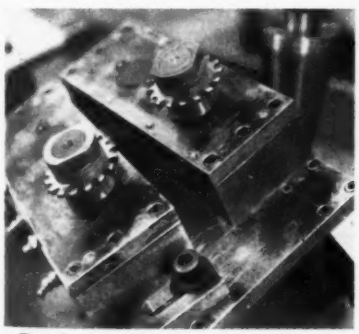
Since the cutting tip runs cool, and chips will not weld to it, no cutting oils are necessary. In addition the tool is non-absorbent, and unaffected by corrosion.

National distribution of the new Raybestos Keramik cutting tools will be handled by L. C. Chappel & Company, 1137 Post Road, Fairfield, Conn.

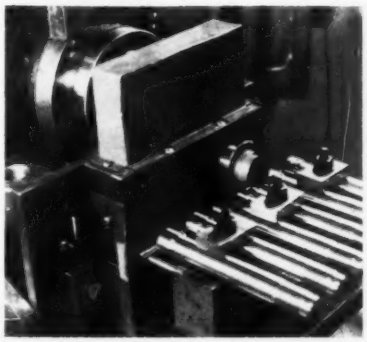
Groove Cutting Speeded Up 275%

A two spindle cutter attachment for a horizontal milling machine has resulted in speeding up production on one milling operation an estimated 275%.

The attachment was designed and built by the tooling section of Otis Engineering Corp., Dallas, Texas, to eliminate the old method of cutting two grooves on the top end of a carrier mandrel one at a time.



Previously, it was necessary to cut a groove on one side of the top end of the carrier mandrel, then index the part 180° in order to cut a groove on the opposite side. With the aid of the two spindle attachment and a specially built quick loading gang fixture, six of the parts can now be run at once, and both grooves cut simultaneously.



The cutters mounted on the two spindles are turned by a series of four gears, one of which operates off the drive gear mounted on the regular arbor spindle. The cutter attachment is adjustable from ¾" to 2" to accommodate any of the parts within those diameters.

Otis Engineering manufactures highly specialized equipment for sub-surface control of oil and gas wells. The carrier mandrel is a part of the Otis locking mandrel, and it is the grooves on the carrier mandrel that hold two shear pins which in turn fasten the running tool to the mandrel for its descent down the well tubing on a wire line.

PIVOT punch introduces cylindrically ground punches with *MORE QUALITY* features than *EVER BEFORE*

HIGH SPEED STEEL
Greater impact strength and wear-resistance.
GUARANTEED CONCENTRICITY
between point and shank within .0002, T.I.R.
LEAD GROUND ON THE SHANK
for perfect alignment in retainer holes.
HOT HEAD FORGING
(On Shoulder Punches) eliminates head fracture.
48-HOUR DELIVERY
Complete stock of all standard sizes.
HIGHEST
Quality
AT LOW PRICES
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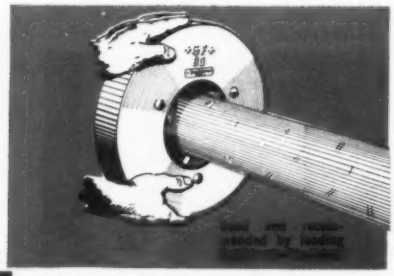
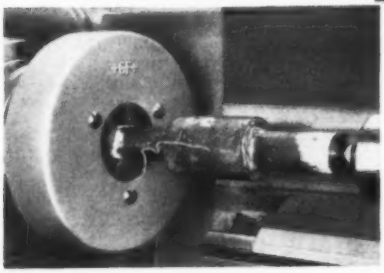
NORTH TONAWANDA, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 153

SKINNER +GF+ WORK DRIVERS





the best for turning on centers

They're fast, powerful — the ideal means for driving smooth or rough bars and forgings located on centers! Jaws are easily reversed to accommodate direction of spindle rotation. Five sizes handle work from ¼" to 8 1/16" diameter.

• ½ turn does the clamping — no wrenches needed • Each size has wide clamping range • Cuts clamping and unclamping time • Clamps out-of-round work evenly • Clamping force always matches cutting pressure.

Write Skinner or your Skinner distributor for folder.

THE CREST OF QUALITY

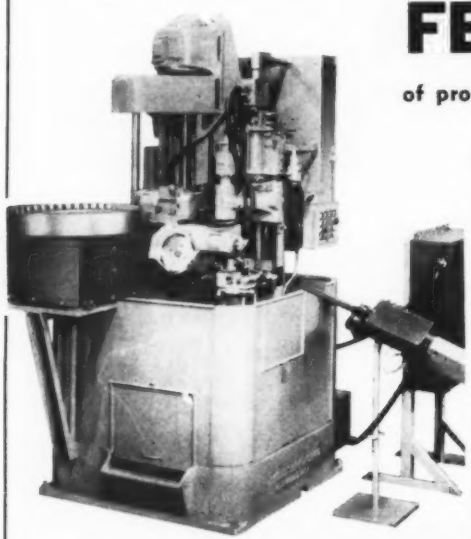
THE SKINNER CHUCK COMPANY
211 Edgewood Ave., New Britain, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1541

SYNTRON

PARTS FEEDERS

of proven dependable quality



Syntron Parts Feeders provide an automatic controlled method of feeding small parts of almost any size, shape or material single file, in oriented positions at speeds to meet production schedules to placing devices, indexing tables, dies, marking table, etc. By means of a gravity fed track when it is necessary. This will cut production costs by increasing capacities of automatic installation. Electromagnetic, no wearing parts easy to install.

For more information on how to cut production cost and increase capacities with Syntron Parts Feeders write for catalogue data free.

Syntron EB-2 Parts Feeder automatically loading single-spindle hobber.

SYNTRON COMPANY
341 Lexington Ave. Homer City, Penna.

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CONTRACT TOOLING AND PRODUCTION

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DESIGNERS AND BUILDERS
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Founded in 1908. Builders of Special Machinery. General Machine Work.

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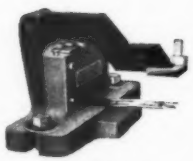
NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines. Special Machinery, Tools, Dies, Jigs, Fixtures.



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AUTOMATIC SCRAP CHOPPER
3" wide $69.00
6" wide $95.00
12" wide $195.00
Write for details

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96 High St., Hingham, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1543

HONEYCOMB CORE QUICKLY TRIMMED AND DENSIFIED

Metal honeycomb core used in aircraft today is trimmed to suit airfoil shapes, and in critical areas the cells are compressed (densified) to achieve higher strength.

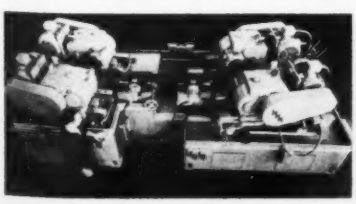
Martin has developed a machine which does the job quicker, more accurately, and 50% cheaper. It

consists of a worktable and clamping device to hold the parts, and an adjustable roller which runs along tracks on the side of the table. It is manually operated. The core is placed on the table, measured, and clamped. The roller is adjusted, pushed along the track, and the core is densified to exact specifications.

MILLING FOUR KINGPIN BOSSES SIMULTANEOUSLY

Milling the two kingpin boss surfaces on each end of forged truck axles is performed simultaneously on a double duplex milling machine.

The machine, designed and built by The Motch & Merryweather Machinery Company, 888 E. 70 St., Cleveland 3, Ohio, is constructed with two adjustable tables on each side of the base, so that settings can be made to mill the part at various angles. On each table are mounted opposed (right and left hand) milling heads, each on broad hardened ways. The right hand tables are mounted on ways in order to adjust the distance between the pairs



of milling heads. Each milling quill has a 2" adjustment so that an accurate distance between the milling cutters can be set. The fixturing is universal in type, so as to equalize endwise and provide for variance in part design and size.

The part is loaded by hoist into the fixture and the operator mechanically equalizes it endwise. Hydraulic clamping is done when the cycle button is pressed. The cycle consists of: rapid traverse of the four milling heads to milling position; feed of the four heads simultaneously across the surfaces to be milled; stop; rapid traverse return to the starting position; and unclamping the fixture.

All machine movements are automatic, except for loading and unloading the part. The control and actuation are by hydraulic power. The milling heads are of the universal type, heavy duty, single speed, with provision for speed changes by change gears.

This machine accomplishes a specific task, and yet can be adapted to similar parts by varying the positions of the universal components which hold and machine the work.

BURR-MASTER

For Every Gear Deburring Job

You can't afford obsolete methods when Burr-Masters can "deburr and chamfer" gears and splines up to 300 teeth per minute!

Universal machines for internal gear and spline deburring. Data in Bulletin 103-81.

Hypoid pinion deburring machines are available in single or multiple station models. Data in Bulletin 103-100.

Eight Universal models, single or two station, deburr and chamfer spur or helical gears and external splines. Get complete data in Bulletin 103-60.

MODERN® Industrial Engineering Co.

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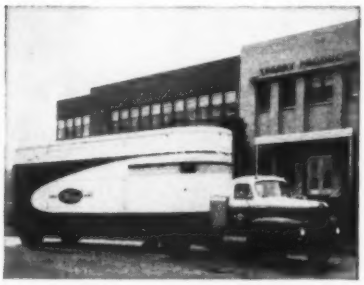
Sperry

ultrasonic inspection news

THE SHOW'S ON THE ROAD!



Sperry's new ULTRASONIC CARAVAN is now on a nationwide tour of plants and factories throughout the United States.

The Caravan's compact exhibits will demonstrate every aspect of ultrasonic testing and equipment to management and engineering personnel. You will see all types of Sperry Reflectoscopes, signaling and recording devices — in action... in your own plant... using samples of your own materials or products for testing!

If you are located in one of the nation's larger industrial centers, the ULTRASONIC CARAVAN is probably already scheduled to visit your plant. If not, your Sperry Representative will be glad to discuss the possibility of a visit to your plant or area. Return coupon for itinerary of the ULTRASONIC CARAVAN.

sperry products INC.

Danbury, Connecticut

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Please tell me when the Ultrasonic Caravan will be in my area.

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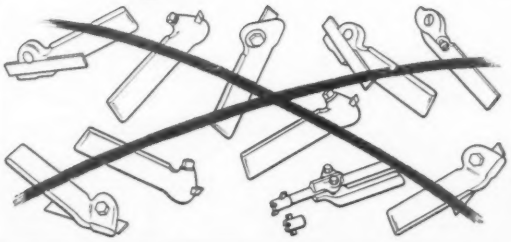
CIRCLE INFORM-A-GRAM KEY NO. 1561

ONE ALL-PURPOSE TOOL HOLDER INSTEAD OF TEN



One tool holder for all positions . . . No tool chatter . . . can do internal boring or internal threading . . . Ideal for carbide tools . . . Bit sizes: 1/4", 5/16", 3/8", 7/16", 1/2", 5/8".

Furnished with Cobalt Bits

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New York 7, N. Y.

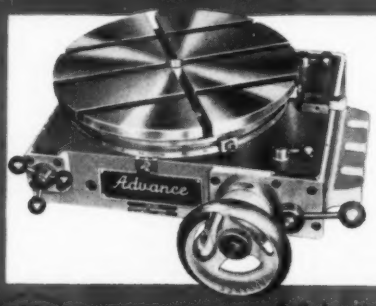
CIRCLE INFORM-A-GRAM KEY NO. 1562

Developed by TOOL MAKERS for TOOL MAKERS

ADVANCE CROSS-SLIDE ROTARY TABLE

Permits fast, precise positioning of workpiece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table.

30 Seconds Accuracy



ADVANCE 15" ROTARY TABLE

This rugged, precise tool is designed for all types of work requiring rotational accuracy. Its maximum speed and precision, and minimum maintenance fills the need for a precision unit at a moderate price.

Full details on request.

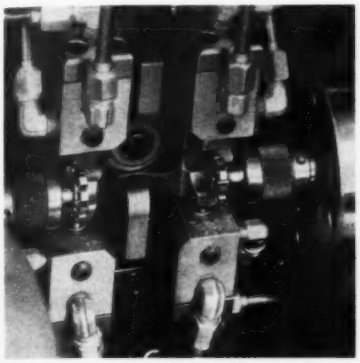
MORRISON ENGINEERING COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 1563

Boring Machine Runs Continuously Milling Auto Parts

With its spindles running continuously, a standard double-end Ex-Cell-O precision boring machine is attaining double the old production rate in milling a steel propeller shaft pinion flange. Machining operations consist of facing and undercutting with milling cutters at two places on each part.

The machine is a basic Ex-Cell-O precision boring machine with



Close-up of part clamped in the fixture. The machine table feeds the work to rotating cutters.

extra-wide bridges for transverse mounting of the spindles. It is arranged for both automatic and manually-controlled operation.

One part is loaded as a second one is being machined, resulting in a net production rate of 188 pcs/hr. The workpiece is held in position by push-button operated hydraulic clamps. Safety devices prevent operation of the machine if a part is improperly loaded or clamped.

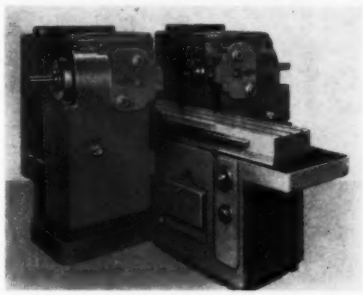
Automatic Milling Machine Features High Production

A new type of automatic milling machine, having a number of advanced production features plus several unique features for convenience and simplification of setup, is being built in plain, duplex, and plain rise-and-fall styles.

These machines, identified as Powermatics, are built by The Cincinnati Milling Machine Co., Cincinnati, Ohio. Powermatics offer increased cutting capacity (up to 10 hp) and higher spindle speeds (up to 3000 rpm) for taking conventional milling or climbing cuts with either high speed steel or carbide milling cutters.

Through a cycle selector unit, a single lever initiates the complete milling operation, including automatic table cycle, automatic spindle stop, automatic backlash eliminator, and automatic spindle carrier cycle of R & F machines. To aid in setting up the machine, all these features can be nullified or bypassed for manual control.

The sequence of all automatic functions is controlled by the cycle selector, actually an assembly of cams on a rather short demountable shaft in the bed. Dogs control the length of stroke only. Cycle selectors have been designed for almost every conceivable automatic cycle and may be changed in less than a minute when changing setups.



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Economy!

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8 hrs. @ 2000 pieces/hr. 16,000
Labor @ $1.60 hr. $12.80
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with Dickerman Feeds (83% press efficiency)
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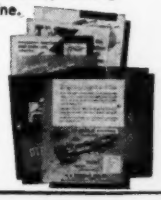
Dickerman Press Feeds don't get tired. Dickerman Press Feeds produce — and keep on producing — 24 hours a day if necessary without let-down, human error. Downtime is negligible—even on million plus runs.

Dickerman Press Feeds mean real savings, real gains. Dickerman Feeds cost little to install — pay for themselves in days — pay profits year after year AND as Dickerman Feeds will operate at any speed the tooling will withstand, unit cost drops as production increases. For automation . . . For new economy . . . install dependable Dickerman Feeds on all your press equipment now!

TOOL AND DIE DESIGNERS . . . .

Full scale templates on all Dickerman Hitch Feeds®, Die Feeds and Rol-Di-Feeds available upon request.

SEND today for catalogs on the complete money-making Dickerman line.



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H. E. DICKERMAN MFG. CO.

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'POWERPAK' USED WHEREVER HYDRAULIC POWER NEEDED

An exceptionally compact hydraulic powerpak just being introduced by Oil-Dyne, Inc., promises to revise the design of products now employing bulky, space-wasting hydraulic units and will make possible the use of hydraulic actuation on applications never before feasible.

A typical complete Oil-Dyne powerpak unit measures less than 9" in height, 6" in length and 4½" in width. It requires no cumbersome mounting base and may be mounted anywhere, in horizontal or vertical position. In vertical mounting position, the pump may be inclined as much as 45° in any direction from vertical, even while operating.

The unit consists of an electric motor, a high-pressure, low-volume pump, coupling, integral reservoir, automatic valving for cylinder actuation, optional pressure switch and mounting bracket, all designed and built into a single-compact power package.

The hydraulic powerpak eliminates the need for separate solenoid valves, relief valves and reservoirs. Pressures up to 3,000 lbs are developed, with 5,000-lb peaks. Cylinder actuation is controlled through two oil lines between pump and cylinder. Two internal valvings are available: one locks cylinder in infinite holding position, the other allows free movement of cylinder except during actuation.

Electrical circuiting allows use of single or duplex pressure switches to limit fluid and pressures. The only electrical connections required on an Oil-Dyne unit are pushbutton switches, or the equivalent, to actuate forward or reverse motion.

Available with 115-V universal electric motors, Oil-Dyne units may be specially ordered with low-voltage motors, including those designed for operation from 12-volt batteries for portable applications.

A brochure from Oil-Dyne, Inc., 2117G W. Marquette Rd., Chicago 36, gives complete specifications, or —

Circle Inform-A-Gram No. D1.

✓CHECK SQUARENESS
in seconds
NEW!

MAGNETIC CYLINDER SQUARE

360° OF ABSOLUTE SQUARENESS
A POWERFUL MAGNET SECURELY HOLDS THE FACE OF THE CYLINDER SQUARE TO THE SURFACE THAT IS TO BE CHECKED.

- ELIMINATES DISTORTION AND TIME CONSUMING METHOD OF CLAMPING.
- YOU HAVE BOTH SPEED AND ACCURACY.
- CAN BE USED FOR ANY TYPE OF SQUARING OPERATION
- STURDILY CONSTRUCTED FOR HARD USE.
- RE-WORKING IS A SIMPLE PROCESS TO RESTORE ORIGINAL ACCURACY.
- MADE OF SELECTED STEEL TO INSURE STABILITY AND UNIFORMITY.

STANDARD SIZE:
Approx. 3⅛" Dia. x 6" Long—$48 F.O.B. Detroit
(Complete with Case)
ALSO AVAILABLE: 7½" Dia x 14" Long

AA GAGE COMPANY 350 FAIR ST., Dept. C DETROIT 20, MICH.

NMTBA LISTS AVAILABLE FILMS

One hundred and twenty-three films on machine tools and machining operations are listed in a new booklet published by the National Machine Tool Builders' Association. Most of the films have been prepared for sales or training purposes and are concerned with specific machining operations.

With a few exceptions, all films are 16 mm, with sound, and range in showing time from 10 to 40 minutes. Seventy-nine movies are in color. All films are available on a free-loan basis from the companies producing them and requests for the films should be directed to these companies.

Copies of the booklet listing the films are available from the National Machine Tool Builders' Association, 2071 E. 102nd St., Cleveland 6, or —

Circle Inform-A-Gram No. D2.

The world's largest titanium ingot-melting furnace has processed its 3,000,000th pound of metal, according to Titanium Metals Corp. of America. The company is now producing 6000-lb ingots for continuous mill hot rolling of wide titanium sheet and for the production of forgings of large section size.

C I B A

Araldite®
First in Epoxies

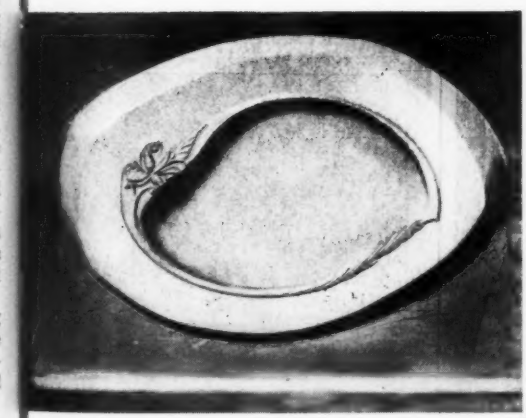
Wherever great strength with light weight, excellent electrical properties, chemical resistance, and an ability to adhere to almost every kind of surface are needed, Araldite "Double Check"* Epoxy Resins are ready to step in with this unbeatable combination of properties unavailable before in one class of basic resins. Results? Case histories like these to point the way to advance your own engineering planning and stream-line production with overall savings in time and money that will bring the all-important "plus" to your profit picture!

SLASHES TOOLING COSTS UP TO 40%!
This die for the forming of airplane part shown is fabricated with a ½" facing of Epoxy Resin over a rough kirksite casting. Time formerly spent on grinding with a blue block is eliminated, and tooling costs are slashed up to 40%.

Formulator: Furane Plastics, Inc.
Customer: Lockheed Aircraft Corp.

LOW COST RETREAD REDEEMS COSTLY DIES!
Details of worn dies, which would cost thousands of dollars to reclaim by former methods, are easily refaced and put back into use by casting Epoxy Resin against a pattern, or actual part. Male punch is faced with a flexible Epoxy formulation.

Formulator: Rezolin, Inc.
Customer: R. Wallace & Sons Mfg., Co.



The Technical Services of Ciba's Plastic Division are the finest in their field. For full information on how Ciba Araldite Epoxies lead to product development and production improvements, write...

*Ciba Araldite Epoxy Resins come with the assurance that they have met not only our rigid PRODUCTION quality control standards but the specific APPLICATIONAL requirements of the user as well.

Ciba produces basic resins only which are formulated for intermediate and end uses by accredited formulators.

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Please send me full information on CIBA Epoxy Resins for

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CITY_____ STATE_____

TRACER ATTACHMENT SPEEDS TRUING GRINDING WHEELS

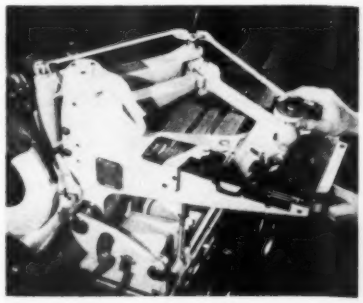
A new form-truing attachment, designed particularly for use on internal and external cylindrical grinders, makes it possible to form-true complex contours on grinding wheels accurate to "tenths" in a matter of minutes.

Known as Diaform Model No. 10 Universal, this new attachment supplements Pratt & Whitney's present Diaform types of surface grinders.

Equally accurate repeat truing can be made as often as required, saving hours of work performed by skilled employees.

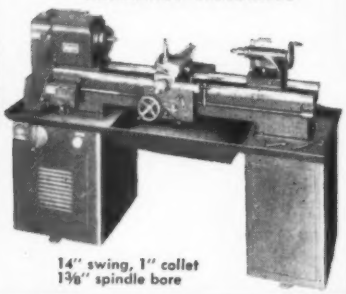
Mounted on the grinding machine table by an auxiliary carriage, the attachment is well out of the way during grinding operations, but is quickly available for re-truing without disturbing the workpiece. The auxiliary carriage provides vertical adjustment for centering the truing diamond to the grinding wheel to suit different makes of machines.

In operation, a tracer is lightly traversed over the profile of an enlarged template of the desired form. Path of the tracer is transmitted at a 5:1 reduction ratio, which reduces



any template error by the same ratio, to a truing diamond that accurately reproduces the form in the grinding wheel. Since a sharp diamond is used, the wheel is dressed as it is form-trued. Maximum diameter of grinding wheel that can be formed is 14"; maximum width of form produced on the wheel is 2"; maximum depth of form is 1".

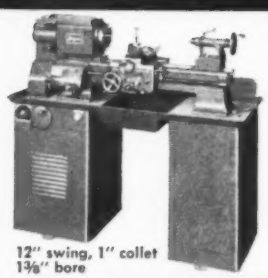
Logan
THE LATHES FOR SUSTAINED ACCURACY



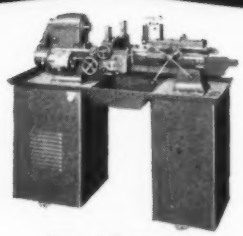
14" swing, 1" collet
1⅜" spindle bore

You can continue to depend on Logans for precision results. On every type of lathe operation Logan sustained accuracy keeps performance at top efficiency. Ruggedly proportioned as well as precision built, Logan Lathes keep their accuracy after years of use in tool room, shop or production.

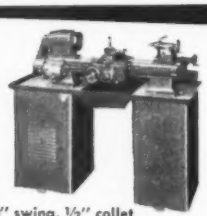
Screw Cutting and Turret Lathes In a Wide Range of Sizes 9", 10", 11", 12" and 14" swing, all with Logan advanced design features.



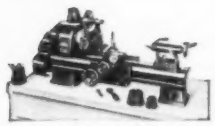
12" swing, 1" collet
1⅜" bore



11" swing, 1" collet
1⅜" bore



10" swing, ½" collet
25/32" bore



9" swing, ½" collet
25/32" bore

See your Logan dealer, or write for catalog information.

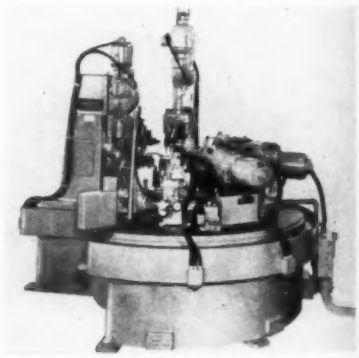
LOGAN ENGINEERING CO.
4901 West Lawrence Avenue, Chicago 30, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 160

MANY-OPERATION MACHINE HEAVY ON AUTOMATISM

It is reported that this 12-station horizontal drilling and milling machine will produce 600 parts/hr at 100% efficiency. The machine is being used to drill, tap, slot, straddle mill, and broach nine different brass throttle shafts.

The operations are accomplished by five cam feed drill units, one lead screw tapping unit, and one air-operated broach. Four of the drill



units with milling attachments are mounted horizontally while one is positioned vertically. The lead screw tapping unit is mounted vertically.

The brass workpieces are loaded into a vee-block and are clamped by a hand screw.

This machine with its unusual efficiency was built by the Machine Tool Division of the Hartford Special Machinery Co., 292 Homestead Ave., Hartford 12, Conn.

Taking the Bumps Out of Railroad Freight Cars

A smooth riding freight car is as important to the railroad freight business as a smooth Pullman is to the passenger service. That is why the Central Research Laboratory of the Association of American Railroads is vitally concerned in finding the best designs to provide smoother riding, longer wearing, trouble-free service under grueling road conditions.

Various designs underwent extensive riding tests for some time on actual test trains, but, this method of testing springs and snubbers would have taken about 10 years to do a thorough job.

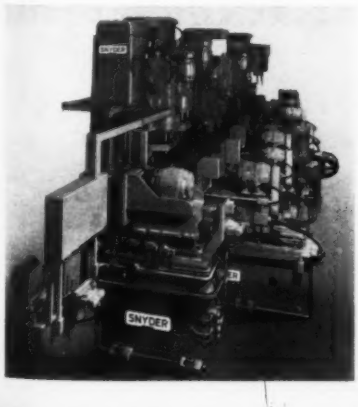
Today, a 50-ton continuous cycling Multipress, manufactured by the Denison Engineering Company, Columbus, Ohio, completes the testing job in 30 days.

In this setup, the freight car truck. minus wheels and axles, is suspended at four points by fixtures that fit in the journal boxes. The press ram, attached to the truck at the center of the truck bolster takes the place of the king pin. Press depresses and raises with a force of 18 to 45 tons.

In operation 16 hrs/day, this testing method will produce the equivalent of 10 years wear in 30 days. Stroke length, cycles per minute and tonnage are all easily adjusted; this press versatility can be utilized for a variety of other testing operations.

Transfer Machine Includes Storage Feature

Workpieces are fed to the boring machine stations as each particular station demands them. Two workpieces are stored in waiting at each machine; when one of these pieces is shifted into position for machining, another workpiece is automatically directed into the to-be-machined storage area.



This segmented transfer machine was built by the Snyder Tool & Engineering Co. to machine, wash and air-test 103 cast iron automotive oil pump bodies per hour. Milling, drilling, reaming, trepanning, tapping, boring, spotfacing, countersinking and chamfering operations are performed in their respective stations. Since many of these operations are to be performed on more than one face, facilities are included for orientation to accomplish this end.

Probing devices shut down the machine if the tap drilled holes are incomplete; if incomplete hole conditions were allowed to exist, the result would be broken taps.

Other innovations are the washing segment of the machine having 8 stations and the air-test segment.

If the workpieces do not pass the air test, they are automatically rejected from the line.

For simplicity of construction, ease of maintenance and to make way for possible design change each segment has its own individual base.

COGSDILL
BURRAWAY
TOOLS

For burrs, fins, and other irregularities, both top and bottom of machined holes the simple action of the BurrAway double-edged cutter blade, controlled by a spring-loaded plunger, completely deburrs any hole or series of holes in line in one quick "in and out" operation..

For high-production applications requiring different depths of chamfer on top and bottom, the Burra-Matic tool offers separately adjustable cams for depth control on both faces. For specific applications of the BurrAway or BurraMatic tools contact our engineering staff for details.

Cogsdill TOOL PRODUCTS, INC.
12980 W. Eight Mile Road, Oak Park 37, Michigan

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Finest Tool Steel at Rockwell 60 62C. Precision Ground Concentric to Max. .00025 T.I.R.

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AMERICAN STANDARD PERFORATORS
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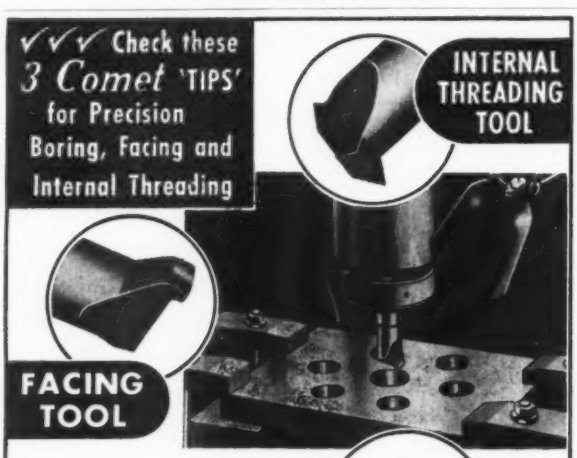
CIRCLE INFORM-A-GRAM KEY NO. 1621

√√√ Check these *3 Comet* 'TIPS' for Precision Boring, Facing and Internal Threading



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FOR HOLES FROM 1/16" UPWARD
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CIRCLE INFORM-A-GRAM KEY NO. 1622

HOLES JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.

A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result—eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

Borrow Vulcan's instructive movie on jig grinding

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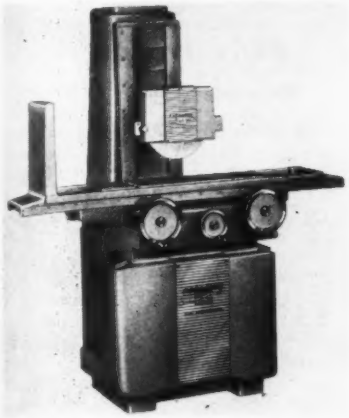
Engineering, Processing, Designing . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size . . . Vulcanaire Grinding Heads . . . Motorized Rotary Tables . . . Plastic Tooling . . . Vulcanaire Jig Grinders.

VULCAN TOOL CO.
741 LORAIN AVENUE DAYTON 10, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1623

ABRASIVE'S NEW 618 PRECISION SURFACE GRINDER

The recently disclosed new precision surface grinder by Abrasive Machine Tool Company, East Providence, Rhode Island, stemmed from a development investment of over $100,000 and 11,000 engineering manhours. The end result is in keeping with today's demand for a small, yet rugged, precision surface grinder that is easy to operate and maintain.



Known as the No. 618, because of its table work capacity of 6" x 18", the new machine incorporates roller bearing saddle ways; 5" deep, box type, stress-relieved saddle with positive anti-backlash; cable and drum table drive; fully enclosed, dynamically balanced cartridge-type spindle; plus hip-level controls and smooth ultra-modern over-all lines.

The machine's sensitive and positive grinding control, attributable to the roller bearing ways, saddle feed backlash eliminator, and cable and drum drive for the table, has been proved in a rugged testing program which involved over 1,000,000 reversals under actual work loads.

Tested at 50% overload, the saddle showed no measurable deflection at any point. The work load is always contained within the limits of the widely spaced saddle ways.

The spindle, table and saddle ways are lifetime lubricated. All other moving parts are oiled from a central one-shot system. The head carries its own lubrication system for the column ways.

The motorized spindle is of generous diameter, of cartridge design. It is totally enclosed, dynamically balanced and lifetime lubricated. The 618 is equipped with either a 12" grinding wheel powered by a 2-hp, 1750-rpm motor, or a 7" grinding wheel with a 1-hp, 3450-rpm motor. The work capacity is 12" to table under a 12" wheel, and 14½" to table under a 7" wheel.

In common with the Abrasive line, the new 618 features easily maintained unit construction.

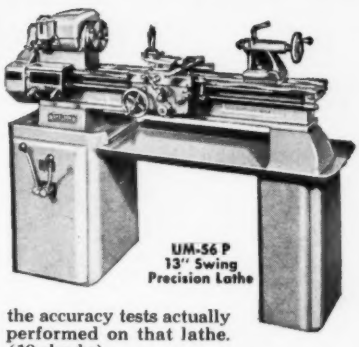
SHELDON Precision LATHES

for the size Lathes You Need Most

Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13". . . in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

Powerful, all-V-belt, drive units—either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

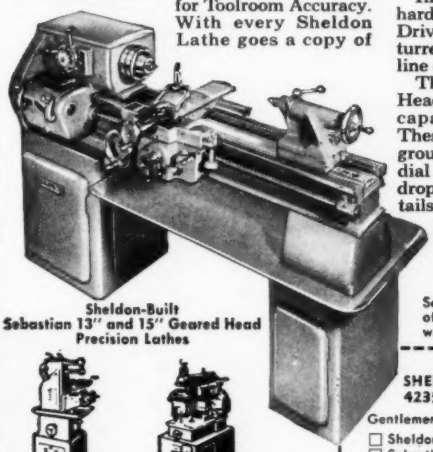
All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).



UM-56 P 13" Swing Precision Lathe

Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.



Sheldon-Built Sebastian 13" and 15" Geared Head Precision Lathes

SHELDON Horizontal Milling Machine

SHELDON 12" Shaper

SHELDON MACHINE CO., Inc.

Builders of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes.

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Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

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☐ Horizontal Milling Machine ☐ Name of Local Dealer
☐ Sheldon 12" Shaper ☐ Have representative Call,

Name ..... Title .....
Company Name .....
Street Address ..... ☐ Company ☐ Home
City ..... State .....

CIRCLE INFORM-A-GRAM KEY NO. 163

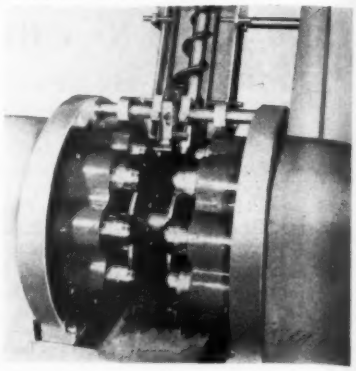
Feed Mechanism Speeds Locating Cans in Flanger

A new spiral-type feeding mechanism accurately locates can bodies in a flanger at extremely high rates of speed.

It was developed by the Can Machinery Division of E. W. Bliss Company, Hastings, Michigan, and was designed for use with Bliss' fast new No. 1315 flanger, which operates at better than 500 cans/min.

The feed eliminates the tendency of can bodies to "cock" or "mislocate" when gravity-fed at high speeds. Because it positively locates bodies in the flanging turret, it eliminates the cause of jams and spoiled bodies whether cans arrive at intervals or in a steady stream.

The spiral on this feed, shown with cover removed, is the accelerated type to separate the cans, and is chrome plated and polished to prevent damage to can bodies. It is capable of feeding several different can sizes, a design feature that enables one or two spirals to handle the variety of sizes found in many modern plants. Timed with the flanger and driven by a sprocket and chain, it is equipped with a safety over-load coupling.



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Make Taft-Peirce Gages
Wear Many Times Longer!
Your money goes a long, long way when you order T-P Electrolized Gages! The combination of lapping plus electrolizing means that every gage will stay accurate, longer. Precision lapping produces an exact-sized gage — no "hills" and "valleys" to wear rapidly and destroy gage accuracy. Electrolizing puts an even film of hard, non-magnetic alloy on all gaging surfaces to give exceptional wear resistance. Initially costing only slightly more than ordinary hardened steel gages, Taft-Peirce Electrolized Gages more than pay for the difference in longer gage life. Result: Your budget for gages goes much farther, and your inspectors work with the best accuracy you can buy. For more information, call or write: The Taft-Peirce Manufacturing Co., Woonsocket, R. I.
Exclusive T-P Pilot
Here's another T-P Plus feature! The Taft-Peirce Pilot reduces inspection costs . . . radius and groove on end of gage member prevents chipping and burring, prolongs gage life. Available on single or double end plug gages.
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TAKE IT TO TAFT-PEIRCE
THE TAFT-PEIRCE MANUFACTURING COMPANY
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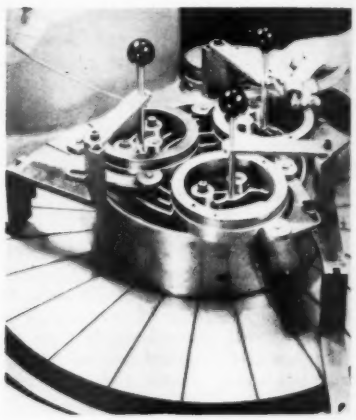
T-P Means TOP Precision

Flat Lapping of Shoulder Faces

Flat lapping of shoulder faces, as well as other lapping, can now be done with new Lapmaster tooling. The arrangement consists of a 12" grooved lap plate mounted in the center of a 24" lap plate. The 12" plate can be removed to permit lapping of other workpieces on the standard Model 24 Lapmaster machine.

There is considerable savings realized with this tooling since it eliminates the cost of purchasing a complete machine for flat lapping of



shoulder faces. The tooling arrangement can be adapted to many other parts where precision finish and flatness are required, including valve bodies and discs such as those used on diesel locomotives and aviation fuel pump parts (illustrated).

The tooling arrangement can also be supplied to fit the 36" Model Lapmaster. These lapping machines are used to generate surface flatness to less than one light band and finishes to 2 rms in short or large production runs.

For full details on the Lapmaster tooling, contact Crane Packing Co., Dept. TPC, 6400 Oakton St., Morton Grove, Ill., or—**Circle No. D3.**

CIRCLE INFORM-A-GRAM KEY NO. 164

VARIABLE MAGNETIC CONTROL SPEEDS DRILLING, TAPPING

An improved portable electro-magnetic drill press has been developed which materially reduces drilling, reaming and tapping time and costs. Major improvements include a rheostat control switch for selecting the proper magnetic pull to fit each particular job, a new pilot light assembly that floods the drill point area with light and helps increase operator accuracy, and a new, more compact rectifier unit for converting ac to dc.

The rheostat switch permits the drill operator to select the amount of magnetic pull needed for both holding the drill while positioning and aligning and for securely gripping the drill to the workpiece while it operates. By controlling the magnetic force the operator can provide

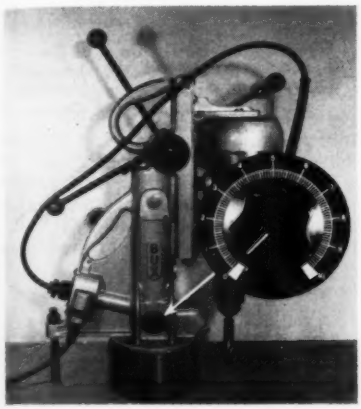


Photo courtesy Buck Mfg. Co.

A rheostat switch permits selection of magnetic pull for holding the drill while positioning and for gripping the drill to the workpiece.

enough power to hold the drill to the work so that he does not have to support its weight while aligning, yet still allow enough play so that he can accurately slide the drill point into perfect alignment. Once the drill is positioned the operator can turn on full power to hold the drill while he works.

Because magnetic power holds the drill throughout positioning and drilling operations, operator fatigue is greatly reduced and labor efficiency improved. The new control should provide big savings in setup time, particularly in awkward horizontal and overhead positions.

The compact rectifier arrangement makes replacement of this component a simple, quick job.

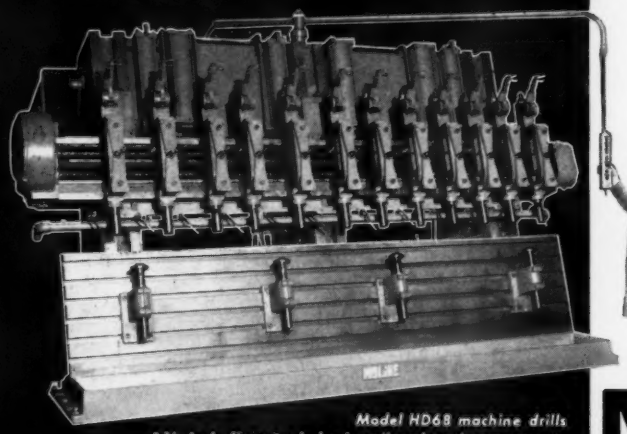
LONG-RANGE PLANT IMPROVEMENTS CALL FOR NEW OFFICER

With the creation of a new top-management post, Director of Plant Improvements, Standard Pressed Steel Co. hopes to prevent its long-range plant improvement program from imposing heavy extra duties on its regular management team.

The improvements are necessary, reasons SPS President H. Thomas Hallowell, Jr., and "concentrated effort is needed so that the Company's capital will be employed most effectively."

Frank G. Kaufman, vice president in charge of product engineering for The Cleveland Cap Screw Co., an SPS subsidiary, has been named to fill the new position. He continues as Cleveland Cap vice president, but will spend a major portion of his time as Director of Plant Improvement for the entire SPS organization.

FOR GREATER · · ·



Model HD68 machine drills 1 ½ inch diameter holes in railroad track components.

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Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

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CIRCLE INFORM-A-GRAM KEY NO. 165

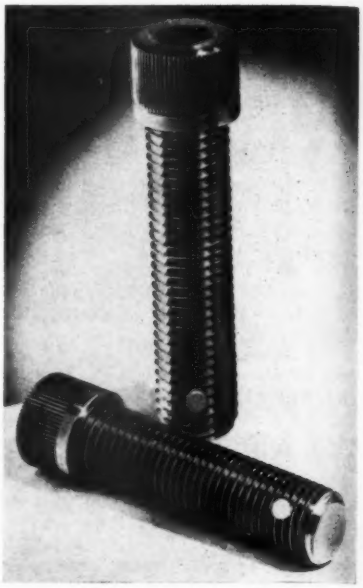
NYLOK SELF-LOCKING INSERT ADDED TO SPS SCREW LINE

The Nylok self-locking insert has been added as an optional feature on precision socket head screws and aircraft bolts made by Standard Pressed Steel Company of Jenkintown, Pa.

Under license from The Nylok Corporation, the process makes use of the resilient properties of nylon to provide self-locking action on threaded fasteners which might otherwise loosen under the severe vibration to which many screws are subjected.

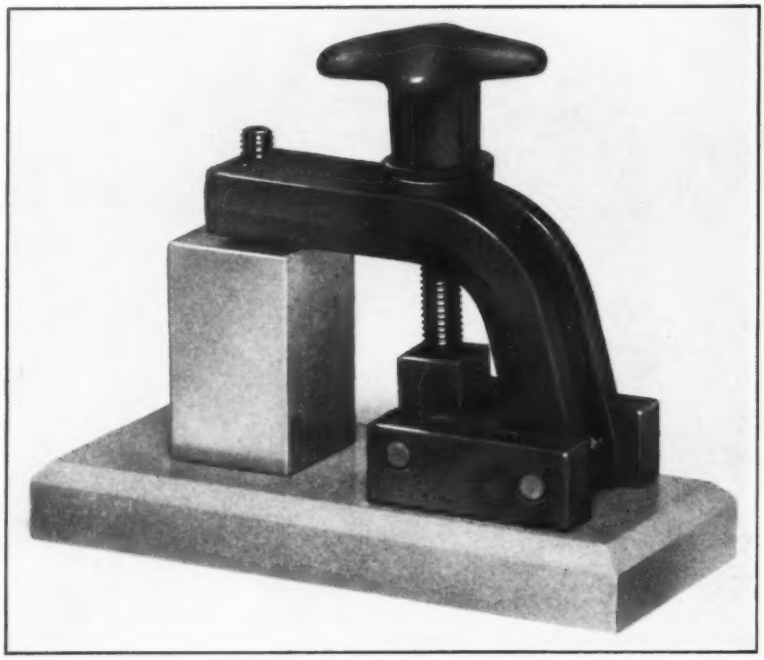
The nylon pellet is inserted in a hole drilled part way through the threaded portion of the bolt. When the bolt is installed in a tapped hole or a standard nut, the exposed portion of the nylon pellet is compressed between the mating threads. In an attempt to regain its original shape the nylon forces the threads together under pressure.

This pressure increases the friction between the metal surfaces, thus resisting the tendency of the bolt to loosen in service in vibrating machinery, vehicles and appliances.



Nylok nylon inserts consist of a nylon pellet installed in the threaded portion of a screw. They eliminate the need for other locking devices.

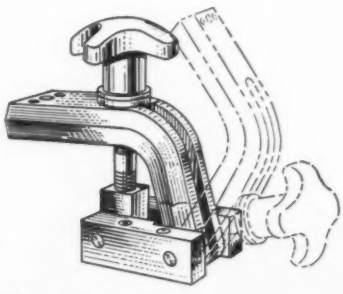
The integrated self-locking device eliminates the need for lock-washers, adhesives and wire-locking in common use throughout Industry.



Infinite Variety

LODDING RETRACTING CLAMPS

Lodding Retracting Clamps lend themselves to infinite variation. Jaws are added to suit work. Tapped and clear holes are there for you to use. Lodding provides four types of action—and your own imagination is the limit to the variety of jaws you can add. Four sizes each of four styles—hand knob, hand cam, nut and air operated.



LODDING, INC.
Worcester 1, Massachusetts

FACTORY WAREHOUSES

Precision Tool Sales, 417 E. Florence Ave., Los Angeles 3, Calif.
Bagby Engineering Co., 1047 Forest Ave., Evanston, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 166

NICKEL COATED STEEL WIRE DRAWN AFTER PLATING

Commercial Fernicklon nickel-plated steel wire, with up to 10% nickel coat, can be used wherever combinations of strength, corrosion resistance and lustrous finish are desirable.

Significant savings of scarce nickel are promised by the jacketed material. In the lamp, radio and television industry, nickel-coated steel wire has proved highly successful in grid supports, lamp leads and small parts — at a saving of up to 95% nickel metal.

Fernicklon, a product of National-Standard Company, Niles, Michigan, uses — as base metal — high carbon, low carbon or alloy steels (copper alloys can also take a nickel deposit). A uniform coat is deposited directly on rod or wire; the material is drawn by conventional methods to finished size. Coating tolerances are maintained within exceedingly narrow tolerances, even in thin coatings.

Commercial sizes of Fernicklon are supplied in the range from 0.010" to

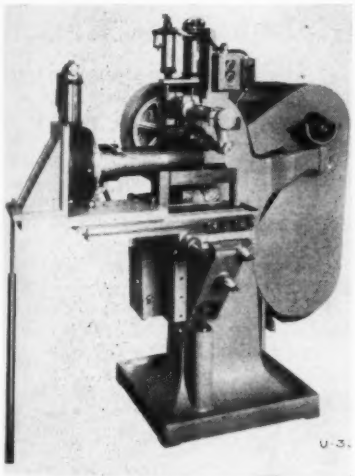
0.310" depending on tensile, in either matte or superbright finish. Using the super-bright finish wire, subsequent finishing operations are seldom necessary. The matte finish has a residual surface lubricant useful in some forming operations, and can be brought to a high luster by tumbling or burnishing.

After drawing, the wire can be annealed, shaped and worked without chipping or flaking of the coating. Such operations as bending, flattening, swaging — even thread rolling — are possible. If certain precautions are observed, it can be spot welded or butt welded.

Stake Notching Performed on Milling Machine

Equipped for automatic feeding and indexing, the U. S. No. 1 milling machine is being used for semi-automatic stake notching of 105 mm and other projectiles on a production basis.

The machine, built by the U. S. Burke Machine Tool Division, Cincinnati 27, Ohio, features a head equipped with a 4" stroke air-hydraulic feed, which provides rapid traverse approach, controlled cutting speed and distance, and automatic rapid return.



The projectile is held in a cup-type holding collet, secured to the center of a vertically mounted pneumatic rotary table equipped with a 5-division index plate. Its operation is coordinated, by the use of limit switches, with that of the head feed. The sequence of operations is as follows:

The projectile is moved from the factory conveyor line into the grooved fixture provided, and is slid into position in the cup-type collet. A partial turn of the locking handle secures it in place.

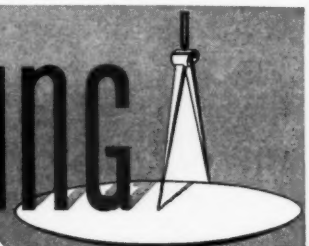
The operator presses the starting button to mill the first stake notch. At the conclusion of the milling stroke the head retracts rapid traverse, and the rotary table indexes to the next position. The head again descends, and the operation continues automatically until all five notches are milled.

At the conclusion of the milling operation, an externally mounted dog, located on the periphery of the rotary table, trips a limit switch, which keeps the head in a raised position, awaiting the insertion of the next shell. Thus, with a setup of this type, one operator can handle two machines.

A pawl lever and locating pin are mounted in the grooved fixture. This serves to locate the nose of the projectile in the event that all projectiles are not the same length.

During the entire operation the table is kept in the same position, thus saving considerable floor space, and permitting the factory conveyor line to be brought to the edge of the table. This eliminates lifting the shells and therefore reduces operator fatigue.

to economize
STANDARDIZE with RING



precision PUNCHES and DIES

Ring Standardized Punches and Dies offer cost saving dependable performance for all of your perforating problems.

Precision volume production to rigid specifications offers

★ Low cost
★ Complete interchangeability
★ Immediate shipments from stock on Standards plus prompt delivery on Specials
★ High quality — long life

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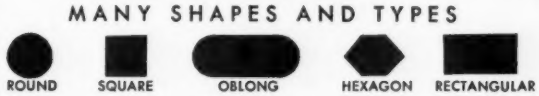

Blanks — Pilots — Headless — Shoulder and Bevel Head Quills — Slug Ejector Punches — Transfer Punches

NEW! Tough — Accurate Retainers for Ring Punches and Dies mount easily to your die set. Available in Key Type for irregular shapes.

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Gentlemen: Please send me a copy of your new, complete CATALOG #105 at once.

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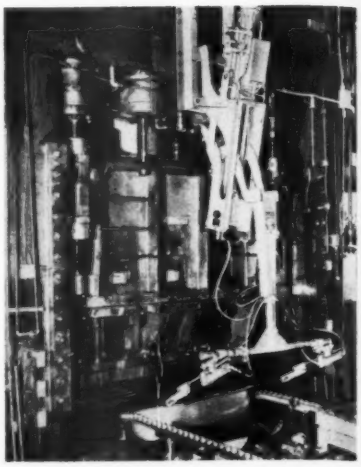
CIRCLE INFORM-A-GRAM KEY NO. 167

Iron Hand Unloads 120 Pound, 6 Foot Drawn Bathtubs

Automatically unloading deep-drawn, 120-lb bathtubs as fast as an 1800-ton press can make them, is a function being performed by a 1956 model Sahlin Iron Hand. Production on this job ranges from 4 to 5/min on blanks which are drawn to 15" deep and are more than 6' in overall length.

Recently installed at the Bristol, Pa., plant of Kaiser Metal Products, Inc., the Iron Hand first lifts the deep tub to clear its die and then swings it out of the press onto a conveyor. As a result of this installation, the company was able to increase production by using this press at its top-rated speed. Further savings came about in the transfer of two men to another line. Therefore, costs were lowered because of the higher output and the lower charges per piece.

This model was specially-designed by the manufacturer, Sahlin Engineering Company, Inc., with a



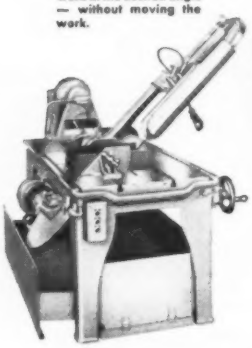
double-mounted jaw assembly to handle the unusual size of the blank. Standard model Iron Hands are ordinarily equipped with single jaws to unload automobile body stampings, appliance parts and other large stampings at speeds up to 35 strokes/min.

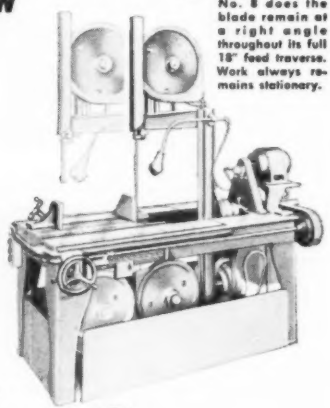
Never Confuse the No. 8 MARVEL with an ordinary Band Saw

...only the MARVEL is Universal

Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.





Only a No. 8 MARVEL can do all of these things: Snip-off a ⅛" rod or cut-off an 18" x 18" cross section.

Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams

Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

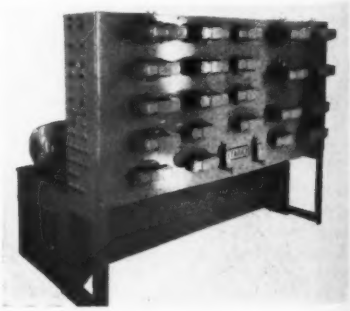
CIRCLE INFORM-A-GRAM KEY NO. 168

Hydraulic Unit Powers Planetary Milling Machine

A planetary milling machine is used by Crane Company of Chicago to automatically machine large valve bodies, up to 10" diameter, finishing all three flanges at once. To operate the machine, a power unit was built by J. N. Fauver Company, Inc., 51 W. Hancock, Detroit 1, for Griffin Engineering Company, also of Detroit.

Automation on the machine permits loading valve bodies in a fixture separate from the machine. When the fixture enters the machine, the remaining operations are all automatic.

Hydraulic equipment furnished includes one single and two double



Dudco vane pumps, driven by a 7½ hp single end motor. All flow control valves were mounted on the machine for accessibility to speed adjustments, except the uncompensated controls, which are of the "sandwich" type, between the valves and the subplates. All four-way valves and connections to the machine were piped to the outlet manifold on both ends of the unit. Reservoir capacity is 200 gallons.

The complete installation meets J.I.C. standards, but special circuits were required to eliminate the "jump" when cylinders started to feed from a stop position. The effects of the oil and air compressibility in the system were eliminated.

Multi-Operation Transfer and Index Machine

A unique new automated 12-station drilling machine, that combines the features of an in-line transfer machine with those of a large center column rotary index machine has been developed which is electrically controlled and hydraulically operated.

Designed and built by Expert Automation Machine Co., 17144 Mt. Elliott Ave., Detroit 12, the machine drills, spotfaces, reams, and deburrs holes in a 39" long, 2⅝" OD bent tubular steel automotive frame cross member at the rate of 200 pcs/hr.

The rotary index machine has a 12' dia cast aluminum sectionalized table. The 6,000-lb weight saving, brought about by the use of aluminum over steel plus a new Expert mechanical cam index mechanism, enables a 2-hp motor to index the 12' dia table on the 8-station rotary index center column machine.

How The Machine Operates

Parts are first loaded into the in-line transfer machine, and then moved by a hydraulically operated pusher bar mechanism to the first station where five holes are drilled in three planes in the part. Next the part is transferred to a third station where the five drilled holes are probed to check for incomplete holes due to drill breakage. Any holes that are incomplete cause the machine to shut down. In the fourth station an automation device operated by two hydraulic cylinders removes the part from the in-line machine and transfers it to the first station in the rotary index machine.

In the rotary index machine the parts are first clamped by a single cylinder-operated mechanism which includes an over-center toggle mechanism and leafspring control. This control provides approximately constant clamping pressure regardless of part bending variations. The table is next indexed to the second station where holes are drilled through two reinforcing plates that are welded to the frame member in angular locations. The same two holes are drilled through the tubing wall in the opposite side of the tube in the fourth station.

The two reinforcement faces are spotfaced in the fifth station. Then the two holes are reamed with a jump feed to cut cycle time. The outside edges of the holes are deburred in the seventh station.

Parts are unloaded from the rotary index machine in the eighth station by another unusual automation mechanism operated by two hydraulic cylinders.

Sesco Punch Press Gripper Feed

AMAZING ACCURACY

ELIMINATES MISFEEDING

INCREASES PRODUCTION

PINCH GRIPPING ASSURES · SCUFF-FREE FEEDING

May be attached to your new or present equipment without alteration or re-work of your punch presses. The unit is adaptable to feed from the left, right, front or back. All of the feeding takes place on the upstroke of the press. Models are available to handle stock up to 48" in width and 36" in stroke. This Unit is positive, accurate and reliable.

For Complete Pressroom Automation

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Sesco INC. 8881 Central Detroit 4, Mich.

engineers & manufacturers of machine tools and press room equipment

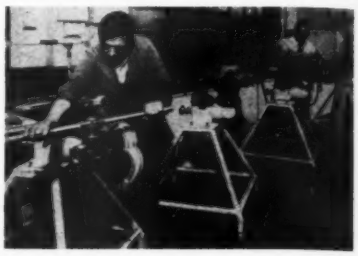
CIRCLE INFORM-A-GRAM KEY NO. 169

Work Positioner Adjusts to Any Three Plane Angle

A work positioner that adjusts to any angle in all three planes, and locks in position instantly helped increase turbo-starter production, conserve floor space, and simplify work in two plants of Rotax, Ltd., noted British aircraft and automotive manufacturer. The unique work positioner is called PowRarm in the U.S.A., and Hydraclamp in Great Britain, but by either name it controls production bottlenecks, as the Rotax installation proves.

Previously, turbo starters were assembled on bench tops. The assemblies were awkward to handle, and nonproductive labor of getting them into position and moving them to the next stage of assembly seriously hampered productive capacity. Another undesirable feature of the operation was the fact that work benches took up a large amount of floor space that could have been used for other operations.

The solution was 34 heavy-duty No. 302 PowRarm work positioners, several of which were mounted on mobile frames. Bench space was reduced, production increased, and most important, an awkward and difficult assembly operation was simplified, and made easy. Now,



basic assemblies are instantly positioned to a convenient angle of approach, and as each stage is completed, both the assembly and the work positioner are rolled to the test station, on the movable frames.

The universal work positioners are manufactured by Wilton Tool Mfg. Co., Schiller Park, Ill., and a licensed affiliate in England.

the cutting characteristics and life of your taps are important factors in your costs of production.

BLAKE Flute and Chamfer Grinders can make substantial savings possible in your threaded-hole costs. They do this by creating or restoring:

1. Exact indexing of cutting edges.
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The accuracy and dependability of the Blake Flute Grinder and Blake Chamfer Grinder make it possible for you to do high-efficiency tapping . . . the *only* kind which pays off in profits today!

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CIRCLE INFORM-A-GRAM KEY NO. 170

New Tool Holder Solves Tricky Grooving Problem

Losing 5 hrs a day fooling with tool adjustments on a high-priced 8-spindle automatic is serious enough. But when you add to this erratic performance on a critical operation because of low tool life, and "springing" of a thin inside diameter of the work, you really have a handful of problems.

That was the situation at G. E.'s Commercial and Industrial Air Conditioning plant, Bloomfield, N. J., until recently when: (1) a new carbide tool design was conceived, and (2) a unique tool cartridge was developed which applied the tool exactly where it was needed every time, and also circumvented the problem of frequent tool adjustments.

As a result, production of a compressor valve plate required for refrigerant valve heads shot up from virtually no production to between 350 and 400 pcs/day. This is ex-

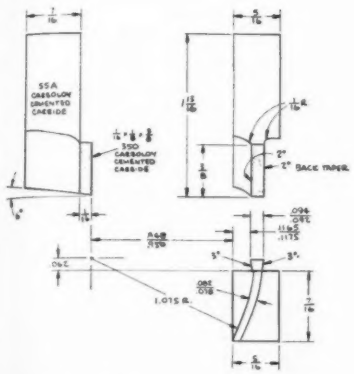


Fig. 1. Tool geometry of grooving tool used to produce critical recess in valve plate. Curved tool shank of Carboloy grade 55A carbide is combined with Carboloy grade 350 carbide tip.

pected to be increased by roughly 25% if use of leaded steel for the part proves feasible.

The job involves machining a punched-out 1340 annealed steel valve plate on an Acme-Gridley automatic cycled every 50 sec. It entails rough and finish turning the OD; rough and finish forming the ID; facing both sides of the part; and, finally, cutting a groove near the inside diameter of the plate.

The groove was the critical part of the job. To produce it required a cut 7/32" deep by 0.093" wide, leaving a wall thickness of 0.030" at the ID of the plate.

All operations on the automatic worked like a charm, except for the grooving. During this cut, either

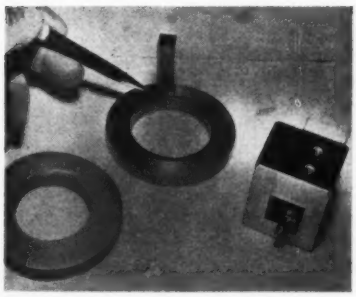


Fig. 2. Left to right, 1340 steel compressor valve plate in rough condition; finished plate with grooving tool positioned in recess; and special cartridge tool holder designed for main tool block of 8-spindle automatic. (Clamp pad is normally used between clamp screws and tool shank but was removed for photograph.)

the cutting tool would give out quickly, or it would "spring" the thin ID wall of the valve plate.

Attempts were made to adapt a trepanning tool as well as an opposed-tool setup to overcome the problem. Both failed. Frequent tool adjustments were necessary to hold size.

The problem was finally overcome by use of a carbide tool that combines properties of two grades of carbide, and by use of a cartridge type tool holder which was adapted to the machine's main tool slide.

The cutting tool consisted of a Carboloy grade 55A carbide tool shank with special geometry, tipped with Carboloy grade 350 carbide. The grade 55A shank directly under the grade 350 tip is curved and very thin as shown in Figure 1. The tip itself is provided with a 3° side clearance and a 2° back taper. Width of the tip is ground to within 0.093" ±0.001.

The new cartridge tool holder is designed so the tool is located from two sides only. As a result, whenever a tool is inserted it is always in the same position as the tool before it.

By having several of these cartridges, they are easily preloaded in the tool crib. Thus, whenever the operator needs a new tool, he simply picks up a preloaded cartridge and inserts it in the main tool block of the machine. Since use of a dial indicator is no longer required, loading the tool block of the machine is reduced to about a 3-min job.

NOTICE
to users of spindles* that need repair or rebuilding

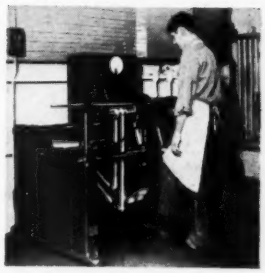
POPE — the leading builder of precision spindles IS THE BEST PLACE TO HAVE YOUR SPINDLES MADE GOOD AS NEW.

Today's grinding, milling and boring tolerances demand precision spindle performance.

Pope puts your spindles in shape *quickly*, at lowest cost. (Cost figures are promptly submitted for your approval before the work is done.)

The same expert craftsmen that build Pope Precision Spindles will assemble, preload and lubricate the proper bearings and dynamically balance. The job will be done *right* the first time.

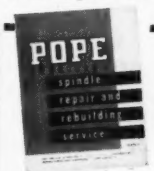
Send Your Spindles for Repair to POPE



Spindles repaired and rebuilt by POPE are assembled in an electrically air cleaned, air conditioned room. They are dynamically balanced, as pictured, to the same tolerances as new spindles. This assures better surface finishes and smoother running spindles.

* POPE Repair and Rebuilding Service applies to ANY SIZE, ANY MAKE of Anti-Friction Bearing SPINDLES.

Belt Driven
Motorized
High Cycle



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Mail me a copy of Bulletin R-1 describing in detail Pope Precision Spindle repair and rebuilding service:

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No. 114

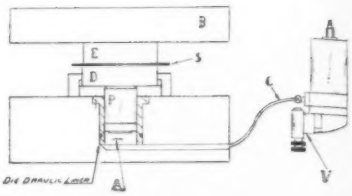
CIRCLE INFORM-A-GRAM KEY NO. 171

Pressure Control for Positive Stock Hold-Down

A simple method of applying hydraulic pressure to die pads is found in the equipment known as Die-Draulic Grip. The operating principle of this equipment is that oil, tapped in built-in small cylinders in which floating pistons operate, is compressed by the downward movement of the die pad against the piston.

Trapped oil is metered back into the storage tank through a special combination control relief and check valve, maintaining a constant pressure, as set, throughout the press downstroke. The pistons are returned to the normal starting position with oil under them by air pressure from the standard shop air line. No air or oil is expelled during the operation.

Pressures up to 5,000 psi may be obtained. The total pressure obtained is the area of all the pistons multiplied by the pressure at which the control is set, thus four pistons of 1⅛" dia, or area of approximately



1 sq in each, will, when the control is set at maximum 5,000 psi, deliver in the neighborhood of 20,000 lbs of pressure. Larger diameter pistons will effect proportionately higher pressures.

When planning an installation, it is possible to calculate on the basis of using a medium pressure setting at the control valve by selecting sufficiently large pistons. Adjustment is possible then in both directions to obtain the exact pressure needed.

When, as in a progressive die, different holding pressures are required at the various stations, a Die-Draulic Grip unit having as many valves as there are different pressure requirements may be used.

These units are built by the Die-Draulic Grip, Inc., 528 Butterworth St., SW, Grand Rapids 4, Mich.

Broaching Machine Features Automatic Transfer of Parts

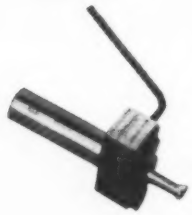
A new horizontal broaching machine featuring the automatic transfering of parts into and out of the work station and a ram speed infinitely variable from 30 to 150 sfm, moves the work through the broaching station from right to left, in the same direction as the cutting stroke of the broach.

In this new machine, Model 60-90 ElectroGear, built by Colonial Broach & Machine Company, P. O. Box 37, Harper Station, Detroit 13, the entire broaching cycle is completely automatic. Parts to be broached are fed by conveyor into the loading station located at the right side of the machine. From the load station, the transfer bar on the machine moves the part onto the hydraulic trunnion fixture at the

NEW!

BOKUM SWING BORING TOOL HOLDERS FOR BOKUM BORING TOOLS

Complete Line FOR ALL MACHINES



The added flexibility of new Bokum Swing Boring Tool Holders now can be used on all screw machines, turret lathes and multiple spindle automatics. The newly-designed holders can be used: (1) On screw machines—even the smallest—you can drill and finish bore and thus eliminate secondary operations. (2) On turret lathes, you can bore from the hex turret leaving the one position free on the square turret for other tooling. (3) On multiple spindle automatics, you can use (with bushings) large size Bokum tools with special short length stubby shanks.

All sizes of holders have accurate vernier adjustments. They are alloy forgings, heat treated for accuracy and long life. All will accommodate Bokum combined helical and radial backed off boring tools (built in clearances) for long life.

Write today for Supplement No. 1 to Catalog 483-E

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BOKUM TOOL CO. 14775 Wildemere Ave., Detroit 38, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 172

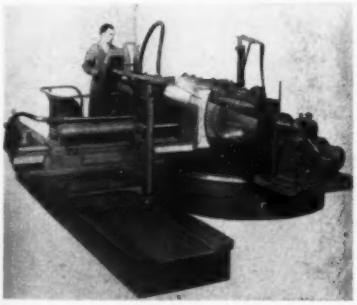
center of the machine. The fixture swings up, positioning the part for the broaching pass. At the completion of the broaching pass, the fixture swings down and another part is fed into position for broaching and at the same time the completed part moves into the automatic unloading station at the left.

In a typical application, the machine broaches gasket faces on automotive cylinder heads at a rate exceeding 200 parts/hr. Gasket surfaces on these heads are held within 0.002" variation despite the high production rate. Either carbide or high speed steel broaches can be used on the Colonial ElectroGear machine.

Radial Draw Former Contours Tapered Sections

Successful results in the contour forming of tapered sections has been experienced by the Cyril Bath Company, Solon, Ohio. New developments now permit the forming in one operation of parts either tapering from end to end or varying in cross sectional area throughout the piece.

Conventional stretch forming techniques are usually not satisfactory because the tonnages necessary to set the contour of the heavier parts would fracture or over-stress the lighter areas. It has often previously been necessary to create long tapered sections either by joining several shorter pieces or by machining the taper after setting the contour.

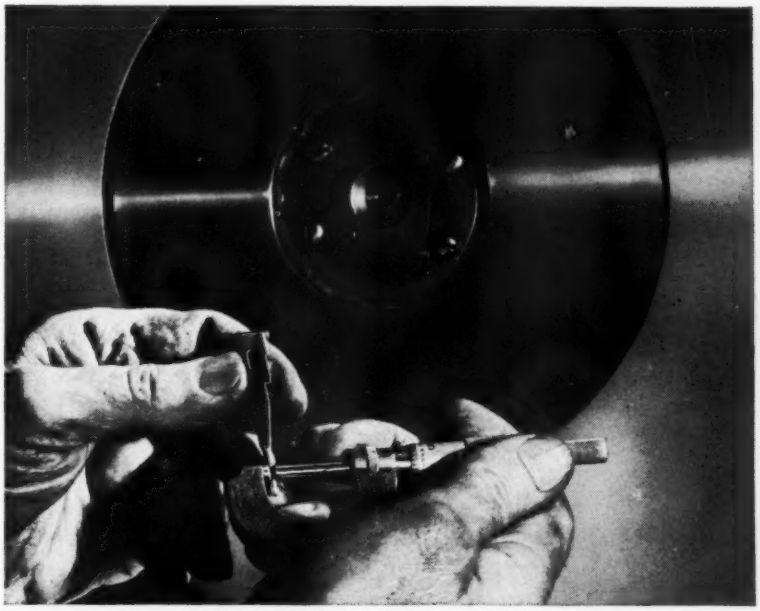


The new techniques employ the use of the Bath Radial Draw Form machine (tension cylinder with rotary table and contour die) with traverse compression unit (hydraulic ram with wipe shoes to iron the material to the face of the contour die).

In one technique, the Radial Draw Former stretch-forms the contour at tonnages suitable to the lighter cross sectional area of the material. Simultaneously, the hydraulic ram unit exerts pressure at the point of tangency of the material and the contour die and progressively increases the pressure to accurately form the heavier cross sectional areas. Thus, both stretch and compression methods are used simultaneously. Pieces are formed accurately and further machining is virtually eliminated.

A second technique employs the hydraulic ram unit as an additional gripper. The wipe shoe member is provided with a rubber backed contact face so that, under pressure, it will be self adjusting to the contour die at any point. The lighter section of the piece is first set to contour with suitable relatively light stretch tonnage. The ram shoe is then brought into contact with material part way along the piece contour and sufficiently forced against the sheet and die to act as an additional gripper. Stretch tonnages may then be increased to sufficiently set the heavier areas of the piece. This relocation of the holding shoe and increase in stretch tonnage may be several times repeated in long parts.

For forming tapered sheets of more complex contours, The Cyril Bath Company has designed pressure shoes consisting of a flexible wipe-face, backed up by a series of shoe segments, each hydraulically powered and so connected as to flex the wipe-face to any desired contour. Both techniques may be used to form sheets, extrusions or other sections.



ROTARY SWAGING
produces precision work

Tolerances of ± .001" and better can be produced by Torrington Rotary Swaging Machines—and with an improved, highly burnished finish!

This firing pin was swaged to a tolerance of ± .001", compared to a tolerance of ± .003" when the part was turned. The switch to swaging eliminated ironing marks which had caused hardened pieces to break. No breakage was encountered after swaging.

Precision work can be performed rapidly with swaging in many different operations including reducing, tapering, pointing, sizing, bonding, forming inside contours or threads.

Send for our informative booklet on Torrington Swaging Machines, or ask to have a technical representative call to show you how you can benefit from rotary swaging.

THE TORRINGTON COMPANY
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6 North Street, Torrington, Conn.

Advantages of Rotary Swaging—

1 **Savings in material**—swaging is chipless—shapes the work instead of cutting metal away.

2 **Savings in labor**—swaging can be done by unskilled labor.

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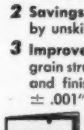


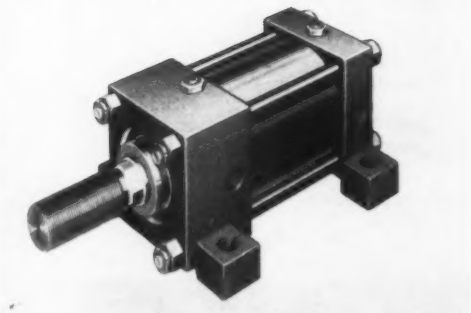
Write for new catalog—It describes swaging benefits, covers selection of a swager, and gives specifications of Torrington's new streamlined Rotary Swaging Machines. Ask, too, to see our new motion picture on swaging.

TORRINGTON ROTARY SWAGING MACHINES
Makers of Torrington Needle Bearings

CIRCLE INFORM-A-GRAM KEY NO. 173

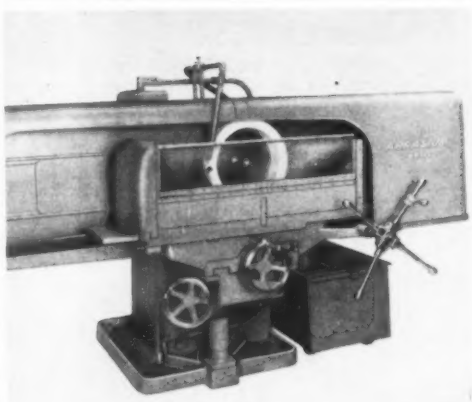
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



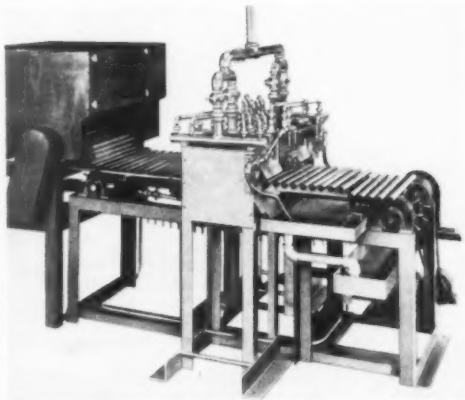
HYDRAULIC CYLINDERS . . .

These Logan Super-Matic hydraulic cylinders feature pressure to 2000 psi; seven bore sizes, from 1½″ to 6″; maximum stroke, 72″ and five mounting styles. The ports can be relocated to any 90° position by rotating cylinder covers. For details, get Catalog 200, Sec. 6, from Logansport Machine Co., Inc., Logansport, Ind., or — **Circle No. A1.**



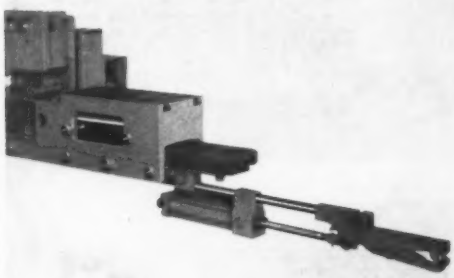
FACE GRINDER . . .

Pulleys and belts are eliminated with this 18″ face grinder incorporating a motorized spindle. At 900 rpm the grinder faces cold or hot rolled steel, tool steels, steel castings and all non-ferrous alloys. It can be applied to any flat, square surface grinding job. Abrasive Machine Tool Co., East Providence, R. I., or — **Circle No. A2.**



HEATING UNIT . . .

This automatic gas-fired heating unit which speeds up tube end annealing, heats from ½″ to 7″ of each end and will handle 1″ to 2″ dia. A hopper feeds tubes to a conveyor which carries them through a heat zone, heating both ends simultaneously prior to bending or flaring. Gas Appliance Service, Inc., 1211 Webster Ave., Chicago 14, or — **Circle No. A3.**

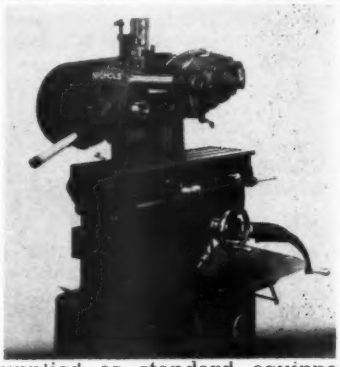


PRESS UNLOADER . . .

Increase production and reduce production costs with this fully, self-contained automatic press unloader. It is synchronized with the press through a limit switch and is operated by two air cylinders. The loader is available in five standard sizes. Sesco Inc., 8881 Central Ave., Detroit 4, or—**Circle No. A4.**

SEMI-AUTOMATIC MILLER . . .

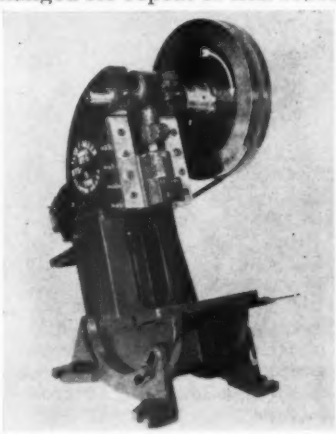
A working surface 8½″ x 30″ and infinitely variable speed from 0 through 60 in/min are features of No. 8-SA semi-automatic miller. The machine is



supplied as standard equipped for automatic pneumatic table feed with rapid approach adjustable feed and rapid return. It can also be provided with pneumatic downfeed of the spindle head. Nichols-Morris Corp., 76 Mamaroneck Ave., P.O. Box 430, White Plains, N. Y., or — **Circle Inform-A-Gram No. A5.**

PUNCH PRESS . . .

Up to 280 operations/min on continuous punching, shearing, forming, riveting, drawing, etc. can be performed by Model B-5 power bench type punch press. The press which is easily interchanged for repeat or non-repeat



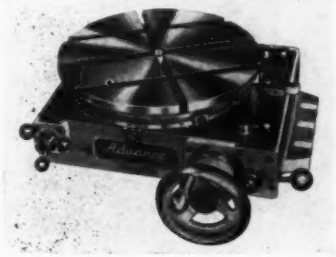
action, handles any workable material within rated capacity. The standard stroke is 1¼″ with ¼″ to 2″ strokes available at an additional charge. Alva Allen Industries, Punch Press Dept., 1001-1015 N. 3rd St., Clinton, Mo., or— **Circle Inform-A-Gram No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

ROTARY TABLE . . .

Designed for all types of close tolerance work requiring rotational accuracy to within 30 sec is this 15″ rotary table. All parts operate in oil bath and the entire unit is self-oiling. The table has a 15″ dia working surface with four T-slots. Rotation stop block and rotational stops can be



clamped on any point. Double worm lock levers are provided to prevent any movement or deflection of worm, even under extreme loads. Morrison Engineering Co., 941 W. Lake St., Chicago 7, or — **Circle No. A7.**

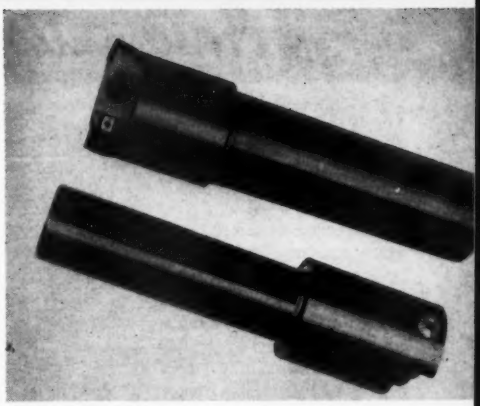
DIEING MACHINE . . .

This 150-ton automatic double crank dieing machine is designed to reduce the unit cost of metal stampings. S-2 Series machine produces large-size stampings requiring large bed areas but not

necessarily heavy tonnage capacities. This unit is engineered to bear loads encountered in long progressive dies while maintaining precision registration of punch and die. Henry & Wright, Div'n of Emhart Mfg. Co., Hartford, Conn., or —
Circle Inform-A-Gram No. A8.

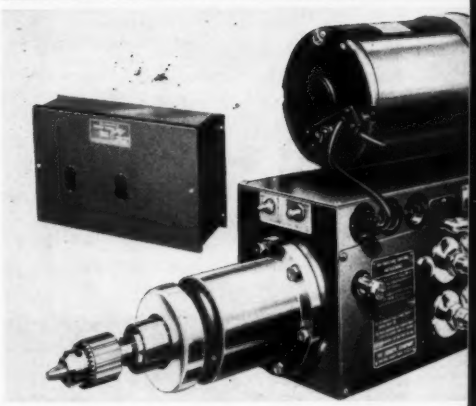
BORING TOOLS . . .

A line of standard micro-adjustable boring tools using throw-away indexable carbide tips, is fitted with a vernier-screw adjustment for diameter of cut. An adjustable built-in chip breaker serves as clamp for the boring tip. The tools are adaptable to internal threading operations. Wesson Co., 1220 Woodward Heights Blvd., Ferndale 20, Mich., or — **Circle No. A9.**



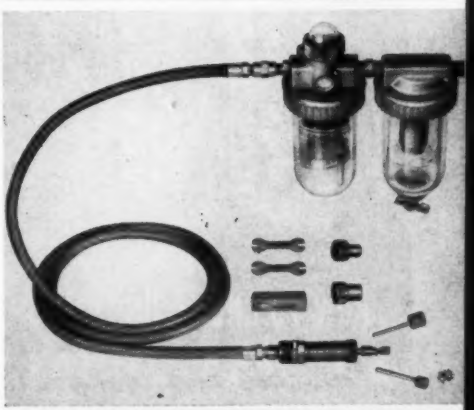
DRILL AND TAP UNIT . . .

With Series 28 Drill-N-Tap, instant change-over from drilling to tapping for long or short production runs is possible without adding a special tapping attachment. It is a packaged unit with electrical and pneumatic controls built-in. The Dumore Co., Racine, Wis., or — **Circle No. A10.**



PNEUMATIC GRINDER . . .

Precision, detailed grinding in tool rooms and on production work is handled by this vane-type pneumatic grinder, which is not much larger than a fountain pen. The rated capacity of the Mini-Grinder is ½″ mounted point or grinding wheel. Buckeye Tools Corp., Div'n 50, P.O. Box 966, Dayton 1, or — **Circle No. A11.**



GRINDERS . . .

Fast setups and rapid action in performing external, internal and angular grinding operations on large workpieces are assured when using 14″ and 18″ Type U-4 universal grinding machines. They feature an infinitely adjustable work speed of 60 to 360 rpm. Norton Co., Worcester 6, Mass., or—**Circle No. A12.**

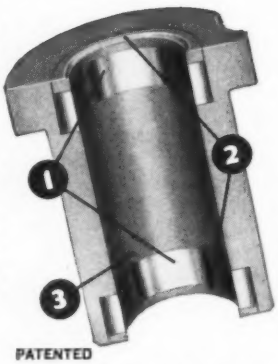
MEYCO CARBIDE INSERTED DRILL JIG BUSHINGS PROVE THEMSELVES

IN Automation !

The reason is simple: these unique bushings are ideally suited for long-running, uninterrupted operations!

MEYCO carbide inserted bushings assure long life for drills, jigs, fixtures . . . accurate work maintained, resulting in less down-time, fewer lost man-hours. Last almost as long as solid carbide bushings, cost slightly more than ordinary bushings. Get the full story:

Write for information and price list, ask for Catalog No. 41.



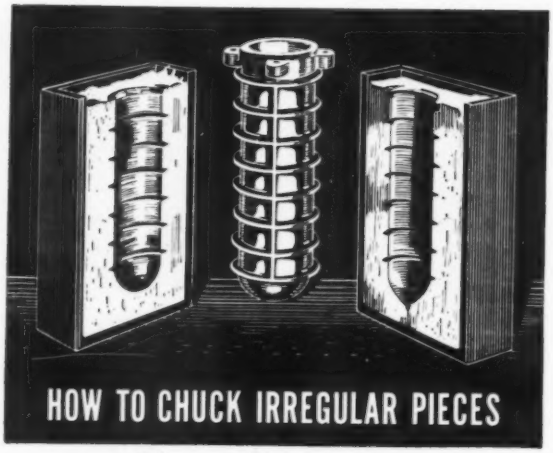
PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

EST. 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1761



HOW TO CHUCK IRREGULAR PIECES

quickly and inexpensively

It's easy to make chuck jaws for irregular workpieces with Cerromatrix®, the low-temperature melting alloy. Just cast it against the workpiece and you get an accurately fitting pair of jaws. The alloy can be cast against forged metal parts, die castings, rubber, wood and most plastics without burning or warping the piece.

Send for Bulletin B5—it tells the whole story.

CERRO DE PASCO CORPORATION

316 Park Avenue, New York 22, N. Y.

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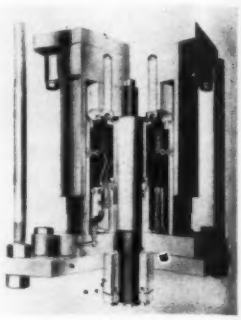
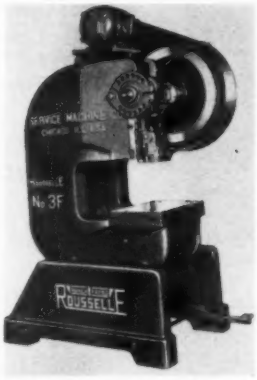
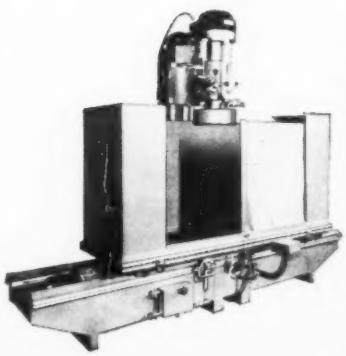


Ring Holding Pressure from 5 to 20 tons is a feature of improved Model DR pneumatic die cushion which can be applied to any power press. This die cushion which is carried in stock, in sizes from 8" to 16", has a high pressure positive lubricating system. An internal guiding means compensates for the off-center loading of the pin pressure pad. Dayton Rogers Mfg. Co., Minneapolis 7, or — **Circle No. A13.**



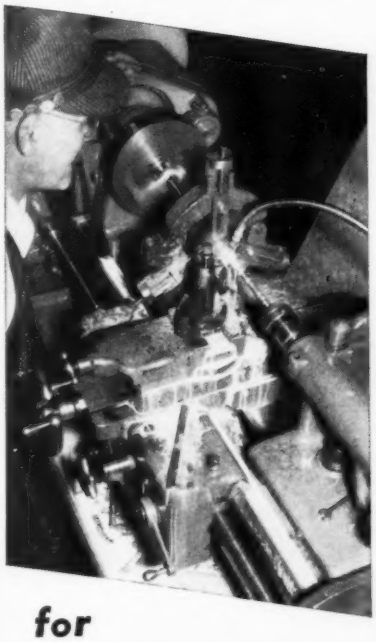
Extra Throat Depth is a feature of the 3F Rousselle 25-ton OBI press. With 15" of throat clearance, it can handle a broad range of jobs. The extra heavy clutch can be set for single stroke or continuous operation. The semi-steel frame is heavily reinforced to provide the necessary rigidity needed in a press of this type. Service Machine Co., 2310 W. 78th St., Chicago 20, or — **Circle No. A14.**

Microinch Finishing of both small and medium size piece parts is performed by a versatile flat lapping machine. Model "18" has the economy, production line speed and volume capacity of large machines. It features an 18" dia lapping plate and attains optical flatness to a smoothness of 2 RMS or finer. Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, or — **Circle No. A15.**



A Tolerance of 0.0002" is a feature of a new wet surface grinder which takes work up to 42" high and 72" long. Feeds on the spindle and table of Model 117 are automatic. A new jig rolls over the work for two or more side grindings. For details, see Catalog 117 issued by Tillis Mfg. Co., Elkhart, Ind., or — **Circle No. A16.**

SOUTH BEND 14½" LATHES



for FAST, PRECISION MACHINING

South Bend 14-1/2" Lathes offer many advantages for precision machining. Ease of operation, speed, power, accuracy, and efficiency are some of the features responsible for their popularity. Often the precision and quality of finish obtained with South Bend Lathes are such that subsequent grinding, honing, or lapping operations are unnecessary. Substantial savings in capital investment, power consumption, floor space, and labor costs have resulted from their installation.

Write for catalog on 14-1/2" Lathes. Also 9" to 16-24" Lathes, Milling Machines, 7" Bench Shapers, 14" Drill Presses and 8" or 10" Pedestal Grinders.

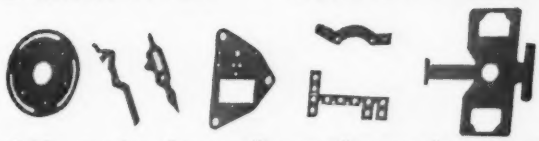
SPECIFICATIONS

Swing—14⅜" over bed and saddle wings
Center Distances—24" to 60"
Collet Capacity—1"
Spindle Speeds—Six to sixteen, 15 to 875 r.p.m.
Power Longitudinal Feeds—48 R.H. or L.H., .0015" to .0841"
Power Cross Feeds—48, .0006" to .0315"
Thread Cutting—48 R.H. or L.H. pitches, 4 to 224 per inch.

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1771

STAMPINGS - - - SHORT RUNS



A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 25 years' experience.

SMALL LOT STAMPING CO.

Linden 3-3700 "Dedicated to Short Runs" 1025 W. Blancke St. Linden, New Jersey

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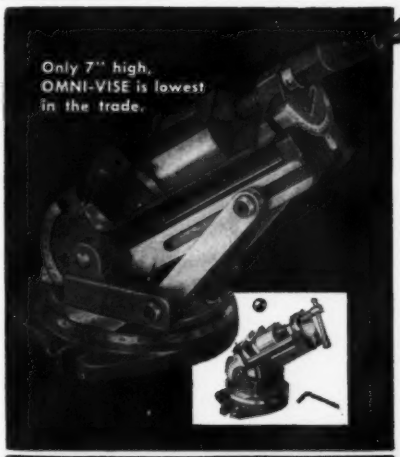

Hold any machine work at any EXACT angle with sturdy OMNI-VISE!

Accurately set in all three planes in only 15 seconds, this sturdy precision vise made in two capacities saves time and headaches for progressive shop operators and pays for itself quickly. Only 7" high (lowest in the trade), **OMNI-VISE** #4, shown at top, is tough, weighs 74 lbs. Jaws are 4" x 1½", open to 4". Base is 9" in diameter with one side straight. Inset shows **OMNI-VISE** #2, a precision low-priced vise. Users find it exceptional for grinding compound angles on carbide tools. Weight, 16 lbs. Height, 4¾". Jaws, 2⅛". Opening, 2⅛". Base, 7¼" x 5". For grinding, drilling or general work at any angle, by hand or machine, an **OMNI-VISE** is the machinist's choice.

Make any type spring, without arbors, FAST with Perkins Spring Coiler!

When you need a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with the new Perkins Precision Spring Coiler! You entirely eliminate the use of arbors, yet turn out precision springs — torsion, compression, extension tapered, or special springs — coiled either left or right hand, in any desired length, any diameter from 1/16" to 12" and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications for replacements or experimental work. Make them fast right in your own shop!

EXCLUSIVE DISTRIBUTORS OF PRECISION MACHINE TOOLS

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CIRCLE INFORM-A-GRAM KEY NO. 1773

Carbide and High Speed

Step drills, step reamers, milling cutters, seating and grooving tools, trepanning tools, form tools, carbide and high speed, made to your specs or designed by our engineers to fit your needs. Form ground with "radial relief" gives up to 500% more tool life, imparts smoother finishes on piece parts. Send for details.

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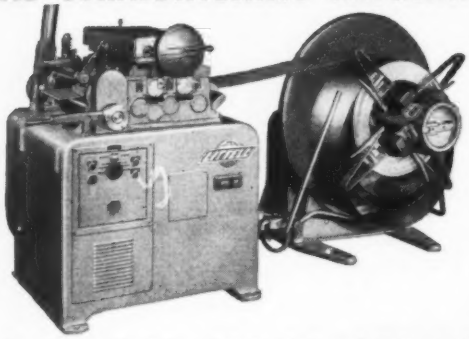
Speed Stamping Output with...

LITTELL

HYDRAULIC DRIVEN FEEDING AND STRAIGHTENING MACHINES



Smooth, powerful Littell No. 4 Series Rack and Pinion machines straighten coil stock up to .125" thick and feed it automatically to any type of punch press or square shear. They feed up to 16" lengths at standard speed, 40 SPM. Set in double cycle, they feed up to 32" lengths at 20 SPM. Used primarily in single station blanking or compound blanking and drawing operations. Also feed to multi-station dies where the final station location is by solid or disappearing stop. Easily moved about by fork truck. Write for Descriptive Bulletin B-10.

F. J. LITTELL MACHINE CO.
Speed with Safety
ROLL FEEDS • COIL CRADLES
STRAIGHTENING MACHINES
REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland
4417 N. RAVENSWOOD AVE. • CHICAGO 13, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1782

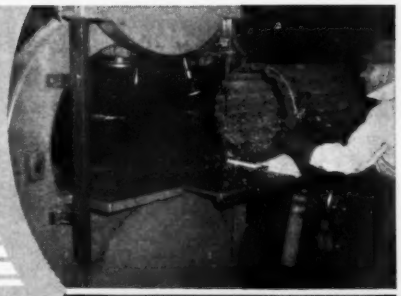
All Drafting Operations can be performed in a seated position with the Draft-A-Matic drafting desk. The drafting platform is equipped with a plastic belt which moves over aluminum rollers at each end of the platform. The drawing moves on the belt within visibility and reach. The General Fireproofing Co., Youngstown 1, O., or—**Circle Inform-A-Gram No. A17.**

Maintain Constant Vertical Alignment of air and electric drills, tapers, screwdrivers and other portable tools on operations within a 30" radius with a self-balancing tool mount. Model M-56 Radarm can be installed on bench, column, or wall. The tool mount which has a self-aligning clamp, is shown mounted with an electric drill. Pneuma-Serve, Inc., P. O. Box 1025, Cleveland 2, or — **Circle No. A18.**

High Production Drilling, tapping and other machining operations are performed by an automatic drill press. The press is available as a standard machine with up to four Model 24 Holomatic drill units mounted in a line. Hause Engineering, Montpelier, O., or — **Circle No. A19.**

The Hydraulic System of this manually operated honing machine assures constant pressure. The stone pressure control is adjustable to the diameter of the piece and material being honed. Model H. M. Honemaster has infinitely variable spindle speeds from 100 to 900 rpm. Superior Hone Corp., 1619 Elreno St., Elkhart, Ind., will furnish a brochure with details, or — **Circle No. A20.**

FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

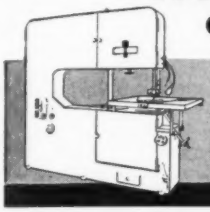


FASTEST, BEST MEANS OF CUTTING METALS

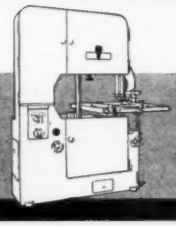
If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS

GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free DI-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1791

Cut Costs!

with the NEW YOST DRILL PRESS VISE

- Developed expressly for use on drill press operations.
- Does away with special and costly jig fixtures.
- Available in two sizes:

No.	Jaw Width	Max. Opening
1D	3½"	4 "
2D	5 "	5½"

Write today for bulletin on the extensive Yost line.

YOST MFG. CO. 124 Grant St., Cambridge Springs, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1792

HAND KNOBS

6 SIZES
CAST IRON

Tapped, Reamed or Blank.
Hex-shaped hub for extra tightening.

Write for catalog

TIETZMANN TOOL CORPORATION
Dept. HK-2 • Englewood, Ohio

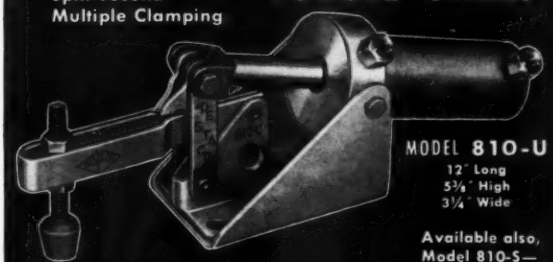
CIRCLE INFORM-A-GRAM KEY NO. 1793

presenting...the NEW

DE-STA-CO Clamp-Omatic

AIR OPERATED TOGGLE CLAMP

for Positive Split-Second Multiple Clamping

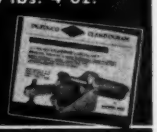


MODEL 810-U
12" Long
5⅜" High
3¼" Wide

Available also, Model 810-S— with Solid Bar

- MORE RUGGED
- MORE COMPACT
- MORE VERSATILE
- LONGER LASTING

Holding Pressure to 750 Pounds with Normal Air Line Pressure of 90 Pounds. Weight 4 lbs. 4 oz.



Write today for Literature on these NEW DE-STA-CO CLAMP-OMATICS— Models 810-U and 810-S

DE-STA-CO DETROIT STAMPING COMPANY
WORLD'S FIRST LINE OF TOGGLE CLAMPS

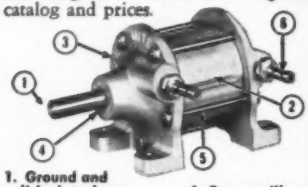
344 Midland Avenue • Detroit 3, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1794

AIR-MITE AIR CYLINDERS

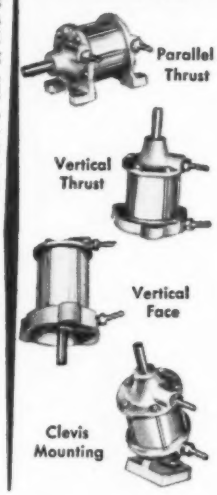
Low Cost...Compact...Powerful...Rugged

AIR-MITE Cylinders—made in single or double acting series—in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling or lifting is required, AIR-MITE cylinders will meet your most exacting standards of dependability and long life. Write for complete catalog and prices.



1. Ground and polished steel ram
2. Brass, true-bore cylinders
3. High strength aluminum alloy cylinder heads
4. Bronze oilless ram bushing
5. Five steel tie rods
6. Brass hose stems

4 Mounting Types

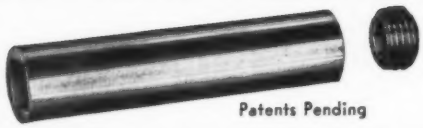


AIR-MITE Devices, Inc.

4417 W. CARROLL AVENUE • CHICAGO 24, ILLINOIS

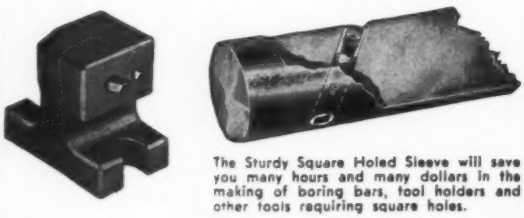
CIRCLE INFORM-A-GRAM KEY NO. 1801

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.



The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

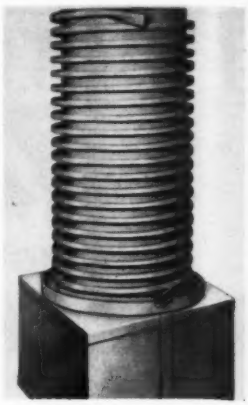
SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

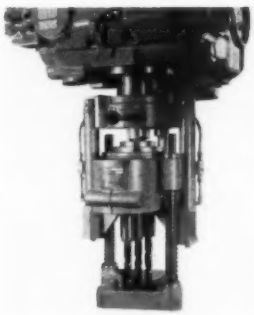
STURDY BROACHING SERVICE, INC.
23516 TELEGRAPH RD., DETROIT 19, MICH.

Write for Literature

CIRCLE INFORM-A-GRAM KEY NO. 1802

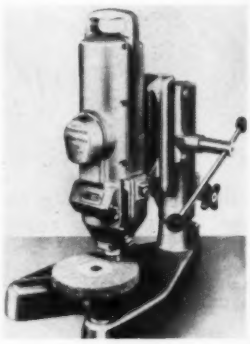
Eliminate Manual Handling of Small Parts in production and processing lines with this "transfer and storage" parts feeder. The feeder receives and discharges parts at required levels and provides storage space for parts between operations. In addition, it orientates the parts prior to discharge. The unit is available in six models capable of handling maximum parts lengths from ¼" to 5". Syntron Co., 341 Lexington Ave., Homer City, Pa., or — **Circle No. A21.**

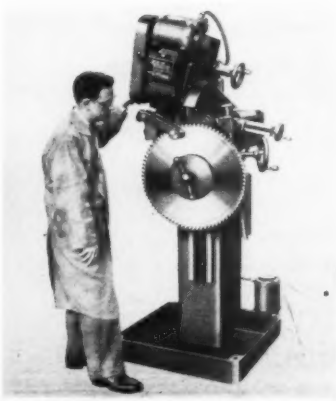




This Air Counterbalance Swivel Attachment makes it possible to adapt large multiple spindle drill and tapping heads to radial drilling machines. Two cylinders maintain a balanced condition of the head on the machine. The attachment is used for drilling condenser plates, flue sheets, etc. U. S. Drill Head Co., 616 Burns St., Cincinnati, or—**Circle No. A22.**

Determine the Hardness of Grinding Wheels with a new testing machine. The New Process Hardness Tester is designed to produce a dynamic test by means of a reciprocating and rotating chisel held under a certain pressure. Also, the uniformity of the wheel can be tested around the periphery. George Scherr Co., Inc., New York 12, or — **Circle No. A23.**





Sharpen Blades from 8" through 45" dia with the G-45 saw blade sharpener. It can grind alternating high and low teeth. This sharpener can grind varying diameters, thicknesses, rake angles and pitches. The Motch & Merryweather Machinery Co., Machinery Mfg. Div'n, 888 E. 70th St., Cleveland 3, or — **Circle No. A24.**

DUSTKOP STOPS DUST

DUST COLLECTORS

37 STANDARD MODELS

SAVES INSTALLATION TIME

Stop dust quickly, at lower cost, with Dustkop. Thirty-seven standard models *ready to use* and available from stock. Dustkop conserves floor space, reduces maintenance. Collects almost all types of industrial dusts. Write for descriptive literature.

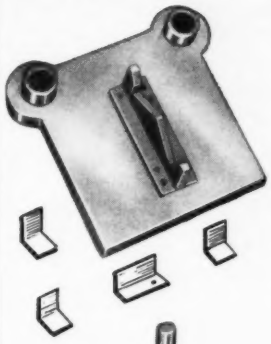
Also a complete line of Mist Collectors

AGET MANUFACTURING COMPANY
1394 East Church St. • Adrian, Michigan

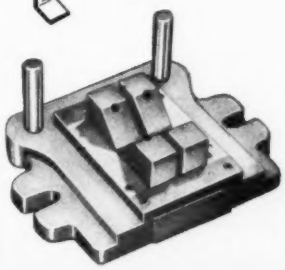
CIRCLE INFORM-A-GRAM KEY NO. 1811

Punches and Dies

Angle Iron Cut Off Die



No. 18, cut off die, for 2"x2"x¼" and lighter angles. Mounted in leader pin die set. Fits most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.



Immediate Delivery

What are your punch and die needs? Consult us about your problems. Prompt service on "specials" made to your order.

Send for free illustrated catalog No. 154 AF. Net prices shown.

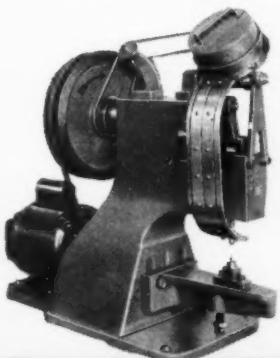
WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1813

Have you looked at your permanent fastenings lately?

EYELETS *can be the key to product improvement and continuing savings!*

Edward Segal | AUTOMATIC EYELETING MACHINERY



Many fastening jobs can be eyeleted at considerable savings over other methods.

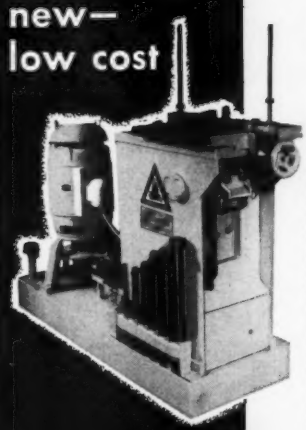
Eyelets usually cost less, and with positive-acting Edward Segal automatic machinery, feeding is simplified. With dependable Segal machines you can get the adjustable travel spindle (Pat Pend.) which permits settings even as tiny as .032" I.D., without fear of costly tool breakage.

Segal engineers will gladly discuss your fastening problem and tell you quickly whether eyeleting is the solution Write today – and also ask for our brochure loaded with eyelet setting data.

EDWARD SEGAL • 72 SPRING STREET, NEW YORK 12, N. Y.
Eyeleting machinery, special hoppers & feeding devices

CIRCLE INFORM-A-GRAM KEY NO. 1812

new— low cost



HYDRAULIC KEYSEATER

- fast set-up—saves time and money
- low cost operation—uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation
- versatile—cuts standard, tapered keyways; internal splines

ONLY WITH BLISS' new Hydraulic Keyseater can you get such a size range *from one machine*—¼" to 2" wide, to 12½" long, standard or tapered. It's easily set up for short or long production runs in small, medium or large plants, warehouses, maintenance departments. What's more, no foundation is needed. Speeds range up to 35 spm; heavy-duty hydraulic system is to JIC specs. All adjustments are readily accessible. Seven cutter bars, with standard tool bits, are also available. Special attachments permit internal spline cutting.

Get all the cost-cutting, time-saving facts by writing today for Bulletin 34 –

BLISS SINCE 1857

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San Jose, California

CIRCLE INFORM-A-GRAM KEY NO. 1814

FREE... 64 PAGE CATALOG

WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

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Dept. TE-9 712 E. 163rd St., Cleveland 10, Ohio

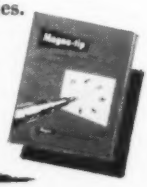
CIRCLE INFORM-A-GRAM KEY NO. 1821

MAKE 2 HANDS DO THE WORK OF 3

with **Magna-tip®**
ACCESSORIES

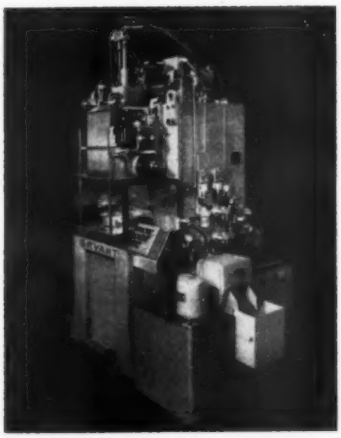
In assembly operations, power screwdrivers equipped with Magna (magnetic) screw and nut holding accessories will give your workers a third hand! High energy permanent magnet holds screw. One hand controls *both* screw and screwdriver. Leaves other hand free to hold job. Ask your power screwdriver salesman to show you these handy, cost cutting Magna-Tip accessories.

'New Manual ready; write Dept. 88-G Complete information on Magna-Tip Bit Holders, Finders, Sockets, and Hand Screwdrivers. Magna Driver Corp., 779 Washington St., Buffalo 3, New York.

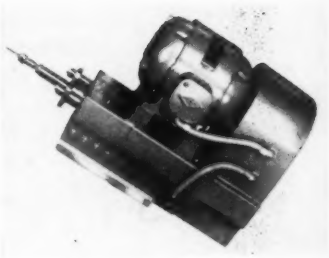


CIRCLE INFORM-A-GRAM KEY NO. 1822

The Unitized Design of the SE-2 line of eccentric-geared presses simplifies maintenance and allows a press to be built to individual needs. All presses in the line are available as a basic press, with no inbuilding or extras unless specified. These presses can be used in job shops and highly-automated mass production plants. E. W. Bliss Co., Canton, O., or — **Circle Inform-A-Gram No. A25.**



A Vertical Version of the Centalign automatic internal grinding machine has been announced by Bryant Chucking Grinder Co., Springfield, Vt. The cam grinder features greater rigidity, stability and accuracy. A typical use is the grinding of 2-lobed bores in hydraulic pump parts at the rate of 130 to 140 pcs/hr. Stock removal is 0.015" to 0.020". **Circle No. A26.**

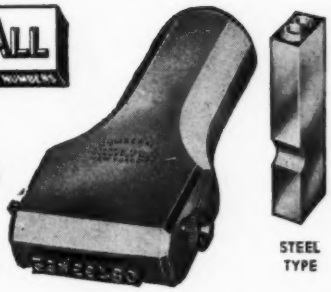


Drive a ¾" Tap in Cast Iron, or a group of taps up to this capacity with this lead-screw tapping unit. The unit which operates in any position, has self-contained cycling and drive, and safety features. Johnson Drill Head Co., 23rd Ave. and 20th St., Rockford, Ill., or — **Circle No. A27.**

Designed for Bending Folded and Seamed Strips and for small box and pan work is this 12" bending brake with slotted jaws. The capacity of the No. 99 Whitney-Jensen brake is 20-ga metal of any kind including stainless steel. Whitney Metal Tool Co., Rockford, Ill., or — **Circle No. A28.**

NUMBERALL
CUTS THE COST OF STAMPING NUMBERS

IMPROVED TYPE HOLDERS for stamping into Metal, etc.



STEEL TYPE

Hand or Press Style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters. Write for Bulletin TP23H.

DETAIL CHASE and PUNCH

FOR QUICK STAMPING OF NAMEPLATES

Model 24

An ingenious tool for rapid stamping of plain, etched or embossed name plates. Used in a small Kick or Power Press, or in our No. 93 or No. 131 Bench Press. Steel Type and Logo Type are dropped into recess. Logo Type are used for numerical and letter combinations.

All lines are stamped in one operation, making tool very efficient. Small, as well as large lots can be stamped economically, neatly. Write for Bulletin TP-24.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1831

Gage Company **PRECISION PLASTIC**

COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

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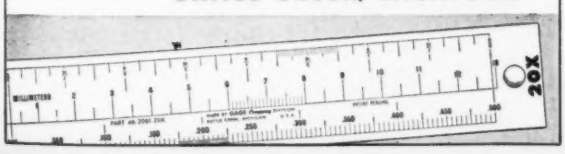
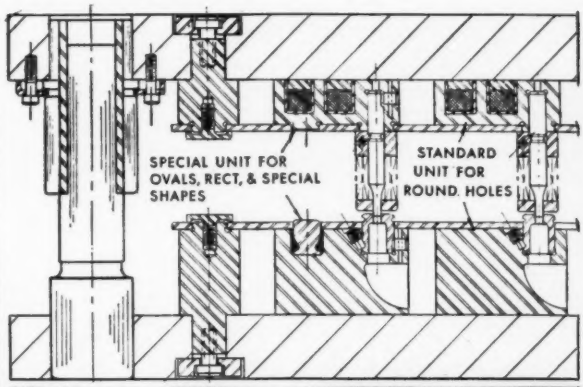
GAGE COMPANY

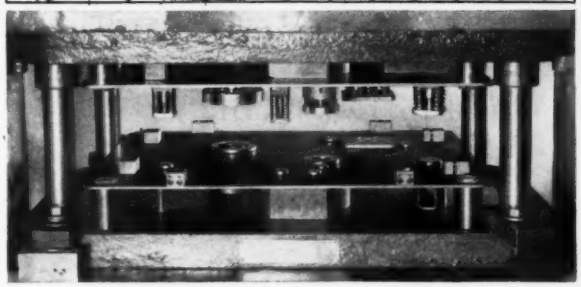
BATTLE CREEK, MICHIGAN



MAGNETIC DIES *by* WHISTLER

• Operate like a single-purpose die • All punch and die parts interchangeable • Pierce metals up to ¼" thick steel • Changes made from one operation to another while the die set is in the press • Change-over time from 5 to 20 minutes, depending upon size of die set • Lower die costs • Saves die storage space • Precision work in any size press • Backed by Whistler's 40 years of die making experience serving the nation's leading plants.





YOU NEED THIS CATALOG... Shows by photos, drawings and prices how the Magnetic Die* system drastically cuts die costs, saves valuable time, speeds production. *Write for it today.*

**Whistler Magnetic Dies are fully patented and are sold under the copyrighted trade name Magna-Die.*

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N. Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

"Visit us at Booth 2014 — National Metal Exposition, Cleveland — Oct. 8 to 12"

Faster, Better, Less Expensive . . .

MARKING with job designed

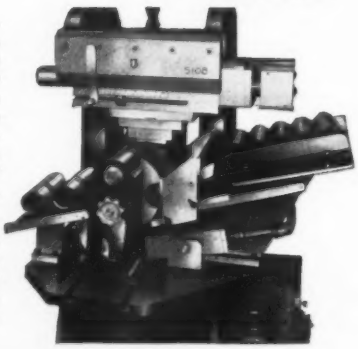
GEO. T. SCHMIDT

Production Marking Machines

The fully automatic, hydraulically - operated tube marker shown here was designed by GTS engineers for major automotive manufacturers.

The units roll a trademark and part number on 2500 to 3000 mild steel thin-walled tubes per hour — a speed that cuts cost per impression to the bone. Hydraulic control keeps all impressions clean, accurate, and of precisely the same depth.

Have a GTS Sales Engineer call on you, without obligation, to discuss how modern marking methods can save costs and speed production in your operation.



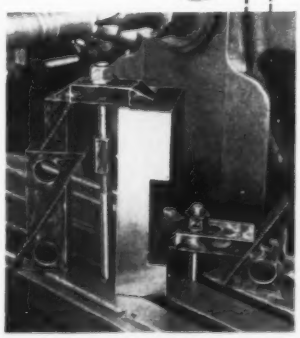
GEO. T. SCHMIDT, INC.
4112 Ravenswood Avenue
Chicago 13, Illinois

If It's Worth Making, It's Worth Marking

CIRCLE INFORM-A-GRAM KEY NO. 1841

WHY WASTE YOUR PROFITS ON MAKESHIFT SETUPS?

- T-NUT & STUD SETS – 12 SIZES
- STEP BLOCK & CLAMP SETS – 5 SIZES
- PUNCH PRESS SETS – 5 SIZES



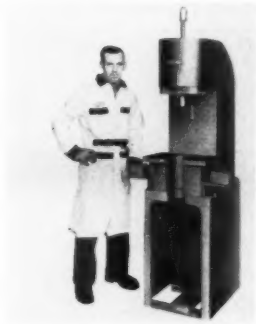
BE WISE Save with NORTHWESTERN

CATALOG No. 23 SENT ON REQUEST

Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1842

Reduce Computing and Layout Time in joining, shaping, drilling and milling with a point indicator that is a combination angle-finding, center-locating and leveling device. The Miracle Point indicator is accurate to within 3 min of a degree. A center punch runs through the instrument to aid in marking hole locations. Racine Instrument Co., 500 College Ave., Racine, Wis., or—**Circle No. A29.**



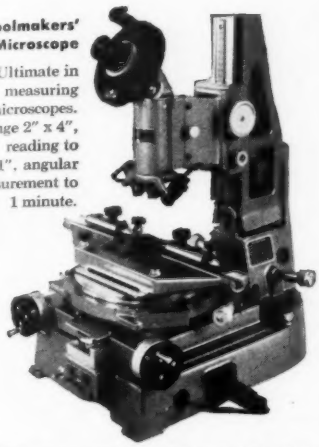
Forming, Flanging, Riveting, broaching, staking, crimping and other press operations are performed by a low cost air hydraulic press with a 15-ton capacity. C-500 Model has a force in far greater proportion to its size than any other make. The standard model has an 8¼" throate and delivers a 6" stroke at 10 cpm. Air-Hydraulics, Inc., 264 Belden St., Jackson, Mich., or — **Circle No. A30.**

Replace the Regular Clapper Box on shapers and other metalworking machines with the Zierco tool head. It provides automatic mechanical backstroke relief over a 360° range. The tool head performs internal die cutting, small hole internal slotting and shaping "T" slots or tongue and grooves in one setting. Zierden Mfg. Co., 3815 S. Kinnickinnic Ave., Milwaukee 7, or—**Circle Inform-A-Gram No. A31.**

A Honing Range from 0.120 to 2.500 without adapters is provided by Model JCP honing machine. The coolant unit which is enclosed in the base has a 10-gal capacity. The spindle speeds are variable from 400 to 1000 rpm without changing belts. Mandrels or stones can be changed without the use of tools. Superior Hone Corp., 1619 Elreno St., Elkhart, Ind., or — **Circle No. A32.**

Toolmakers' Microscope

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.



Precise measurement to 0.0001"

Slash rejects, save money with Gaertner measuring microscopes

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.

Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".

Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Scale Micrometer or Shop Microscope

High quality, low cost instrument with range up to 0.100". Reading to 0.001", easy interpolation to 0.0002".

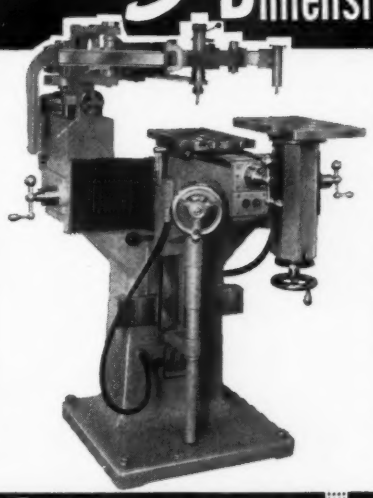
Write for Bulletin 161-54 showing applications, models, specifications.

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 1851

3-Dimensional panto-miller



For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:

Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard *and* special production problems. Write for Bulletin PM3, which gives details and specifications.

2-Dimensional panto-miller

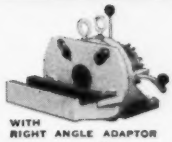
Versatile and dependable for continuous service, the J & B "Panto-Miller" 2A:

Engraves
Profiles
Die Cuts
Mills

Investigate its advantages for your own applications. Send for Bulletin PM2

3-WAY Indexing Trunnion

Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right-Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin IT3.



WITH RIGHT ANGLE ADAPTOR

WITH FACE PLATE

J&B EST. 1870

JOHNSON & BASSETT, INC.

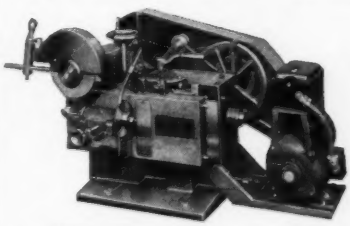
PRODUCTION TOOL DIVISION

WORCESTER, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1852

AUTOMATIC METAL SAW GRINDER

Cuts Costs . . Makes Money For You!



Wardwell's "35 T" will sharpen up to 115 saws .015 thick at one time . . .

This includes slitting and screw slotting saws and milling cutters. Takes saws from 2" to 5½" diameter. Completely automatic. No attention is required after machine is started. These ingenious, compact and sturdy grinders are saving and making money for their owners all over the world.

You owe it to yourself to write for Bulletin 35 T containing full information.

WARDWELL

3809 Ridge Road
Cleveland 9, Ohio

Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1853

INSERTED BLADE GENESEE
FACING AND COUNTERBORING TOOLS

Interchangeable Pilots

Constant Chip Space Throughout Life of Blades

Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks

H. S. S.—Carbide Tipped Blades. Save 25% or more over cost of Solid Tools

Consult our Engineering Department on your Inserted Blade Production Tool Problems.
WRITE FOR CATALOG 54P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools • Since 1908

CIRCLE INFORM-A-GRAM KEY NO. 1861

NEW!

Em-re
PRECISION
DIAL INDICATORS
THE MOST ACCURATE MADE

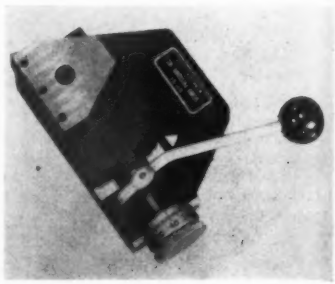
Some time ago, we recognized the need for a dial indicator with greater accuracy . . . So, using the finest tools, materials and workmanship that money could buy, we began building the "Em-re."
The result, a fully-jeweled, precision dial indicator that will consistently (after millions of checking operations) give *repeated*, accurate readings — surpassing A.G.D. tolerances. Furthermore, this is the only 100% shockproof mechanism on the market . . . Stocked in 24 models having 6 ranges from .025" to .250" with graduations in .00005", .0001", .00025", .0005" and .001".

Patents Pending.

Now — we suggest you do three things:
(1) send for Bulletin 455-E
(2) purchase a sample for your gage man to check
(3) compare it with any brand you are using . . . and send us an order.

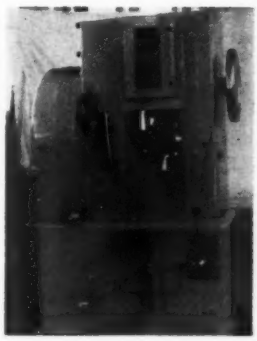
PETZ-EMERY INC.
PLEASANT VALLEY, NEW YORK

CIRCLE INFORM-A-GRAM KEY NO. 1862

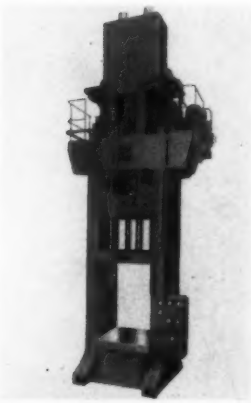


More Rapid and Accurate Engine Lathe Threading is possible with the SP-51 lathe attachment. The unit is ideal for cutting small grinding reliefs at shoulders and for inside threading. It has a micrometer adjustable stop assuring repetition to 0.0005" dia. Sierra Precision Inc., 925 S. Magnolia Ave., Monrovia, Calif., or — **Circle Inform-A-Gram No. A33.**

Model 828 Liquid Spring for draw dies using liquid compressibility has been announced by Taylor Devices Inc., 188 Main St., North Tonawanda, N. Y. This self-contained liquid spring doubles the stroke of equivalent coil springs while tripling the preload and end load with low spring rates and high spring force. By using an internal hydraulic levering principle, the spring develops up to ten times the force of a standard heavy-duty coil spring of the same diameter and length. Model 828 is 1" dia and 3½" long, has a ⅝" stroke with a 480-lb preload and end force of 1000 lbs. For details, see Catalog L.S., or — **Circle Inform-A-Gram No. A34.**



A General Lubrication System that reaches 21 points is a feature of the improved mechanical briquetting press developed by Haller, Inc., Plymouth, Mich. Other features include a volume controller filler shoe mechanism and a core rod bracket. The press is available in capacities from 8 to 40 tons. The improved press permits production of better powdered metal parts at faster rates. **Circle No. A35.**



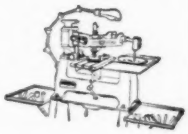
Electric Magnetic Controls are a feature of a 575-ton triple acting hydraulic press. Adjustments of speed, timing and pressure for automatic or semi-automatic operation can be made from the main control panel on the press. No cams are used to make speed changes since the cycle pattern can be changed to a new setup by resetting six control knobs on the panel. A. B. Farquhar Div'n, The Oliver Corp., 108 N. Duke St., York, Pa., or — **Circle No. A36.**

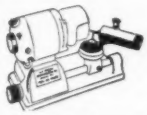
ENGRAVING, 2 AND 3 DIMENSIONAL

all can be done on a

PREIS-PANTO ENGRAVER

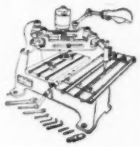
Model 3D-5 Three Dimensional Engraving and Die Cutting Machine features reversible spindle for enlarging and reducing from a model, die or sample.





Model CG Cutter Grinder for sharpening, engraving and routing cutters.

Model UE Engraver for metals, plastics and other materials. Attachment available for electrical marking or acid etching hardened steel.



PANTO Master Copy Type, Cutters and Collets for all types of Engraving Machines available.

Trade Mark

PANTO

For immediate attention write directly to manufacturer below. Ask for nearest representative.

H. P. PREIS ENGRAVING MACHINE CO.
647 U. S. Route 22 Hillside, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1871

COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the diemaker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

Sole Distributors
MOORE SPECIAL TOOL CO., INC.
726 Union Avenue Bridgeport 7, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1872

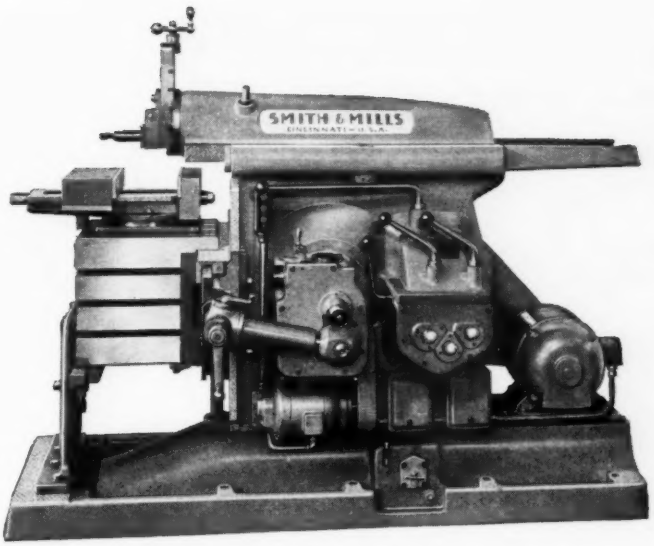
LIFTING DEVICES

for
FAST · SAFE · BETTER
Material Handling
of
· SHEETS
· COILS · BOXES
· MOLDS
· DRUMS · PALLETS
400 MODELS

Prompt Delivery
Write for full particulars

H. L. BUSHMAN CO.
100 W. Central Ave.
Roselle, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1873



Bull ram gear, rocker arm and universal table trunnion made of ductile iron for extra rigidity.

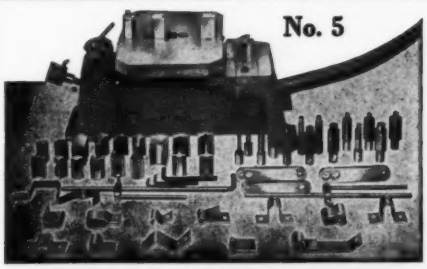
SMITH & MILLS SHAPERS— for production and tool room

Compare Smith & Mills with any other shaper for versatility, speed, cutting power and precision performance. *Compare* and you'll *buy* Smith & Mills—famous for high quality shapers since 1888. Write or wire for prices, deliveries, repair parts or field service. Smith & Mills Shaper Division, Nebel Machine Tool Corp., 3401 Central Parkway, Cincinnati 25, Ohio.

Smith & Mills Shapers now available in Heavy Duty Models in 16″, 20″, 25″, 28″, 32″ and 36″ strokes, and Standard Duty Models in 20″ and 24″ strokes.

Smith AND Mills
SHAPERS CINCINNATI

CIRCLE INFORM-A-GRAM KEY NO. 1874



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Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

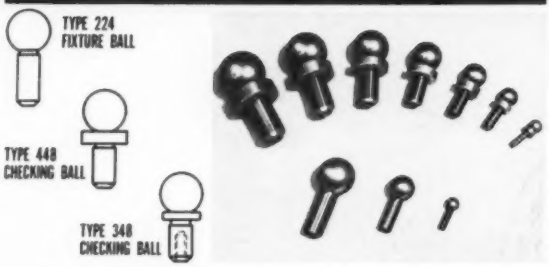
Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛″x1½″ as illustrated. Punching and round end blanking dies available. Other models up to ¼″x4″ air operated.

ALSO AIR OPERATED MODELS

J. A. RICHARDS CO. KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1875

High-Precision Stainless Steel
TOOLING BALLS



- For gage, jig and tool work. Center of ball provides positive reference point for work in any plane.
- Highly accurate. Ball size held to ±.0001" for fixture balls; ±.00002" for checking balls.
- Durable; corrosion-resistant. Made of Type 440-C stainless steel, hardened to 55-58 Rockwell C.
- In stock: Types 224 and 448 in 7 ball sizes, ¼" through 1" by ⅛" steps; Type 348 with ½" ball and 6-32 tapped shank. Other sizes to order.

WRITE FOR price list and ASTE Data Sheet.

INDUSTRIAL TECTONICS, Inc.
3685 Jackson Rd., Ann Arbor, Michigan
5007 E. Washington Blvd., Los Angeles 22
ITI
PRECISION BALLS OF ANY SIZE OR MATERIAL
ANTI-FRICTION BEARINGS FOR SPECIAL REQUIREMENTS
TOOLING BALLS — MASTER BALLS — SPHERICAL FINISHING

CIRCLE INFORM-A-GRAM KEY NO. 1881

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

Model "D"

* A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

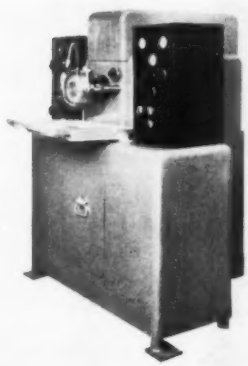
WRITE for COMPLETE DETAILS

CHANDLER TOOL CO.
Muncie, Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

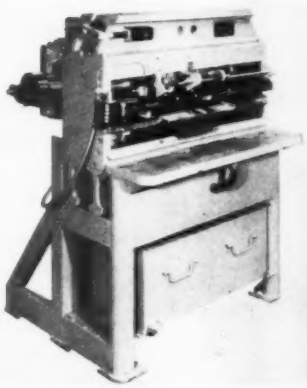
CIRCLE INFORM-A-GRAM KEY NO. 1882

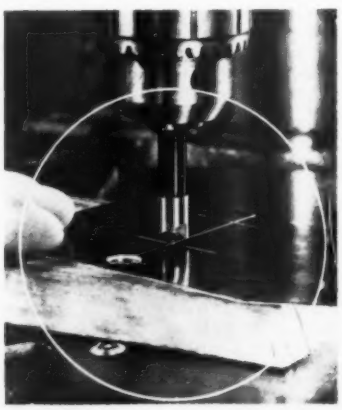
Instantaneous Speed and Feed Control from 100 to 1600 rpm using limit switches and variable speed motors is provided by a horizontal type honing machine. Limit switches control the honing of the part and complete usage of the honing stone. Model S-6 also features automatic loading of workpieces and stone pressure control. A brochure describing the models is made available by National Pioneer, Inc., Box 668, Muncie, Ind., or — **Circle No. A37.**



Minimize Tool Slippage with non-slip, slit-type adapter bushings. These bushings provide positive gripping of drills, reamers, taps and boring tools for automatic screw machine and turret lathe rigid or floating-type holders. The split-type design eliminates pounding tools in and out of the holders, thereby speeding setups. For literature on the bushings, contact Marcellus Mfg. Co., Belvidere, Ill., or — **Circle No. A38.**

Approximately 3000 Shafts/Hr are produced by this shaft knurling machine. It is used in installing the spline type knurl on small electric motor shafts. The machine will produce a knurl up to 3" long on shafts up to 20" long and to ⅝" dia. The Morley Machinery Corp., 1239 University Ave., Rochester 7, N. Y., or — **Circle No. A39.**





Precision Drilling of light-weight materials, even shim stock, is performed by the Roto-Bor tool. This tool cuts from the outside of the circle in. The axially retractable center point facilitates accurate positioning and is removable. Jancy Engineering Co., Davenport, Iowa, or—**Circle No. A40.**

AQ* ------CUTS SHORT RUN STAMPING COSTS--------

PROBLEM:

Relay Support Bracket with
9 holes—two different sizes
Tolerance—hole dia. + .002/− .001; location ± .003
Blank size (developed)—1¼" x 3"
Material—.062 C. R. Strip Steel

RELAY BRACKET HOLE PUNCHING ANALYSIS

CONVENTIONAL Single Hole "Short Run" jig punching
Tools and first 1,000 pieces $125.00
Subsequent re-runs 1,000 pieces $102.00

CONVENTIONAL "Permanent Gang Die" Punching
Tools and first 1,000 pieces $266.00
Subsequent re-runs 1,000 pieces $11.00

FEDERAL "Multiple Hole Process" Punching
Tools and first 1,000 pieces $70.00
Subsequent re-runs 1,000 pieces $41.00

In analyzing the problem it was found that only through Federal's multiple hole-punching process could stamping costs be cut and still hold to rigid tolerances. Let Federal quote on your next *problem piece* and save!

Send your print, sketch or piece for our . . .

***Analyzed Quotation**

Federal TOOL & MFG. CO.
Quality Stampings in Small Quantities

3614 Alabama Ave., Minneapolis 16, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1891

STEP RIGHT UP FOLKS FOR A FREE HELPING OF STINGING CHIPS ···
GET 'EM WHILE THEY'RE GOOD 'N' HOT!!
ENOUGH OF THAT! THE BOSS WANTS YOU TO USE THIS DILLEY MAGNETIC GRIP SHIELD!!
HERE! SLAP IT ONTO YOUR MACHINE AND YOU'LL SAVE EVERYBODY FROM CUTS AND BURNS!
NEXT DAY···
JOE'S PRODUCTION HAS DOUBLED AN' EVERYBODY'S SAFE AN' HAPPY!!
FINE! I WANT "DILLEYS" ON EVERY MACHINE IN THE PLACE!

$10.00 wouldn't pay for the paper work on one chip-produced accident in most plants.

Magnetic Grip-Shields **are so reasonably priced your plant can't afford an accident.**

You try 'em — You'll like 'em. The guard with 101 uses.
Write today for folder with prices.

THE DILLEY MFG. CO. 1633 Ansel Rd., Cleveland 6, O.

CIRCLE INFORM-A-GRAM KEY NO. 1892

Magnetic Base Indicator holders

Erick
Magna Holder
Model 200B
Only $5.45

See your dealer or write for catalogue 755 on the most complete line of magnetic base units & access. mfg'd.

CULLEN MFG. CO., RACINE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1893

Low Cost Automatic
HORIZONTAL STOCK REEL
Self-powered

24" dia. $85.00
30" $90.00
36" $95.00

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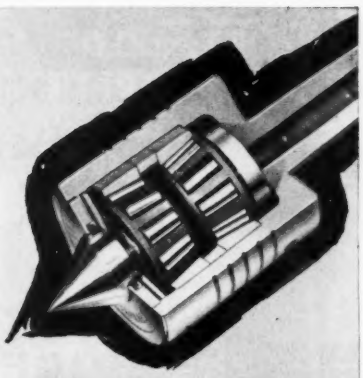
JACO DEVICES, INC.
96 High St., Hingham, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1894



PRECISION BEARINGS

put long life in IDEAL LIVE CENTERS

Specify IDEAL Live Centers and get custom-engineered performance from standard models. Your IDEAL distributor stocks them in a wide range of models and tapers. IDEAL Live Centers are guaranteed to match the accuracy and capacity of your lathe!

SEE YOUR DISTRIBUTOR, OR MAIL COUPON

In Canada: Irving Smith, Ltd., Montreal

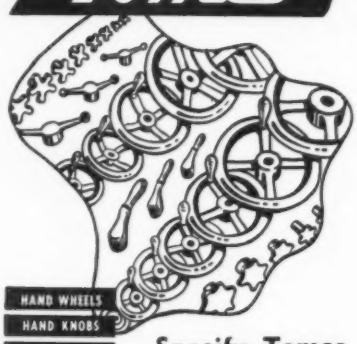
IDEAL INDUSTRIES, Inc.
1334 Park Ave., Sycamore, Illinois

Kindly send us data on Ideal's complete line of LIVE CENTERS.

Name_____
Company_____
Address_____
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1895

Tomco



HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

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Tomco PRODUCTS CO.
1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 1901

new amazing extension probe flashlight

usalite
DUO-FLEX

Powerful 1000 ft. beam plus flexible extension probe light for hard-to-reach dark spots. Uses 2 standard size batteries. Thousands of new industrial uses. Write for details, prices today.

2 lights in 1
No. DF-22
Pat.

U. S. ELECTRIC MFG. CORP.
222 W. 14th St., New York 11, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1902

CAMS

To Your Specifications

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— Except Screw Machine Cams —

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Design Assistance Offered

KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1903

FORD
rotary tools

WHY THEY DO YOUR JOB BETTER

All Ford files H. S. S. and carbide cutters are *precision machine ground* . . . which insures that tooth spacing is uniform and relief angles are constant on each tool. Ford files are handcut by precision craftsmen. On your job, that means more parts per grind. So you save labor on grinding and tool changing. You save on replacements. You save on downtime. What's more, there's less time per part, more parts per hour. In 7 shapes . . . cutting head sizes from 1/8" to 1" diameter, up to 1 3/8" in length. All standard, and *available* in H. S. S. or solid carbide.

Rotary FORD Tools

NEW CATALOG 601 FREE AND LATEST PRICES

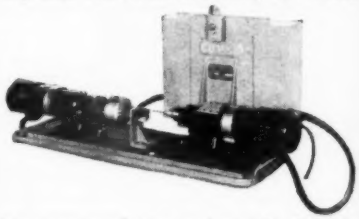
. . . WRITE TODAY

M. A. FORD MFG. CO., INC.
817 W. RIVER STREET, DAVENPORT, IOWA

Precision manufacturer of Carbide End Mills • Countersinks • Grinding Burrs • Special Tools • Factory Regrinding

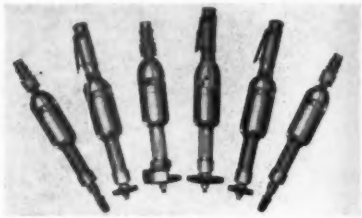
CIRCLE INFORM-A-GRAM KEY NO. 1904

Three Operations Are Automatically Performed with One Loading by a bench-type drilling machine. This machine accomplishes two drilling and one counterboring operation



by means of two automatic drilling units, one with a 2-spindle head. The output rate is more than 300 pcs/hr. Govro-Nelson Co., 1933 Antoinette, Detroit 8, or — **Circle No. A41.**

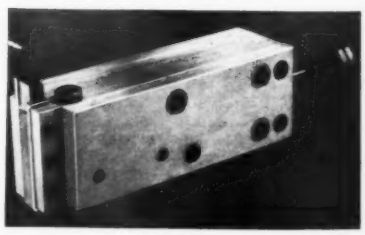
Increased Power, Larger Blade Area, longer rotors and quiet, muffled operation are features of three heavy-duty die grinders. They are available in lever throttle or



Q.A.W. versions. The models range from 3" grinders at 12,000 rpm to ¼" collet-type tools at 20,000 rpm. Master Pneumatic Tool Co., Inc., Bedford, O., or — **Circle No. A42.**

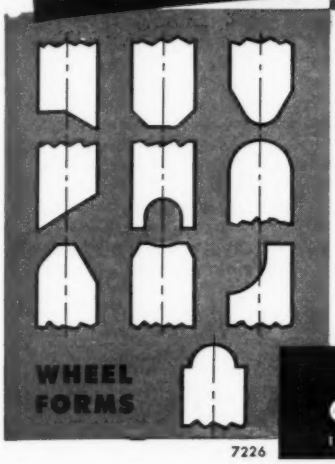
High Shear Strengths without the need of adding an accelerator or catalyst are possible with a one-part epoxy resin adhesive. EC-1386 adhesive provides unlimited working life and good flexibility. It is designed for metal bonding over a service temperature range of −65°F to 250°F. Adhesives and Coatings Div'n, Minnesota Mining and Mfg. Co., 423 Piquette Ave., Detroit 2, or— **Circle Inform-A-Gram No. A43.**

Eliminate Withdrawal Marks on cutting tools in automatic screw machining operations with the Relievomatic. This type of self-relieving tool solves reject problems due to spiral and marred surfaces made by



cutting tools on their return pass. The amount of relief can be accurately adjusted up to 0.010". Silber Products, Inc., 132 Lafayette St., New York 13, or — **Circle No. A44.**

Precision Dress Grinding Wheels to ANY FORM IN ¼ THE USUAL TIME



The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.

Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.

Write for Descriptive Bulletin

PERFEX

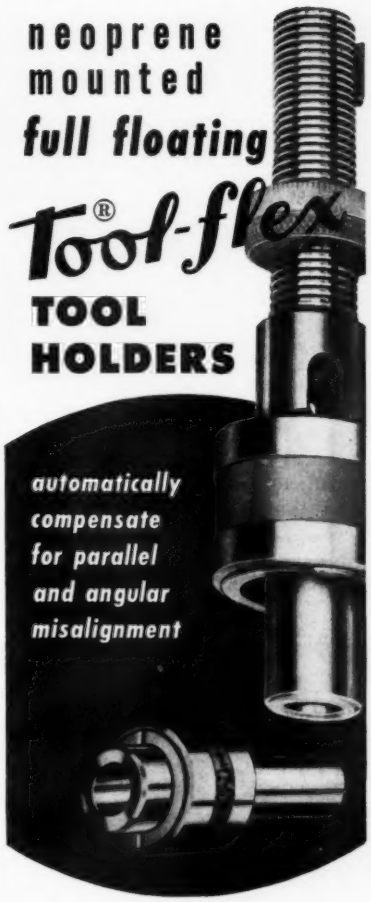
PERFEX GAGE & TOOL CO.

123 AVERY ST. • MT. CLEMENS, MICH.

7226

CIRCLE INFORM-A-GRAM KEY NO. 1911

neoprene mounted *full floating* Tool-flex® TOOL HOLDERS



automatically compensate for parallel and angular misalignment

The oil, heat and wear resistant Neoprene insert, found only in "Tool-flex", provides a universal float that corrects for both parallel and angular misalignment. This assures quick set-ups and minimizes scrap due to bell mouthed and oversized holes or torn and oversized threads. By floating reamers, taps, etc., in a cushion of Neoprene, tool life is increased. Available in a range of sizes and models to suit any requirements, including close centers and Acme threaded shank for multiple spindle set-ups. "Tool-flex" holders are fully guaranteed.

Write Dept. TP-9 for information

BURG TOOL MANUFACTURING COMPANY, INC.

15001 SO. FIGUEROA STREET
GARDENA, CALIFORNIA

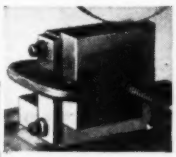
CIRCLE INFORM-A-GRAM KEY NO. 1915

LASSY MASTER V-BLOCK ANGLE PLATES

Proven Time Savers!

A Master tool of versatility for every day use in . . . inspection and machining operations.

Side Gage automatically squares work precisely and without removing angle plate from chuck. Repetitive accuracy maintained.



Adjustable parallel holds the smallest work for position and clamping with ease and accuracy.

The LASSY MASTER Angle Plate is an indispensable tool precisely accurate and dependable.

Write For Illustrated Literature

Lassy Tool Co. Plainville, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1912

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use

$89.95

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

333 Nassau Avenue Brooklyn 22, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1914

PREPARES COIL STOCK FOR PRESS

New Low Cost

LIGHT-DUTY OILER-STRAIGHTENER

$95.00

Handles stock up to 3" wide, ¼" (app.) thick

Write for details

JACO DEVICES, INC.

96 High St., Hingham, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1913

You Can Rely on a ROUSSELLE

THESE 40-TON PRESSES take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are *very moderately priced.*

Manufacturers of Rousselle Presses

Significant savings may result if you let our engineering staff assist you. There is no obligation.

Rousselle Presses are sold exclusively through leading machinery dealers.

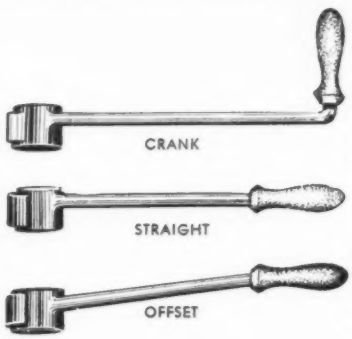
Choice of 25 models in 5 to 40-ton sizes.

SERVICE MACHINE CO. 2310 West 78th Street • Chicago 20, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1921

REID TOOL ROOM Accessories

MALLEABLE MACHINE HANDLES



Made in straight, crank and offset as shown. Finest on the market. Large variety of sizes. Designed to withstand severe usage. Neat in appearance. Finished ready for use. Moderate in cost.

THE REID LINE Includes scores of other tool room needs such as plastic and steel ball handles, C.I. hand knobs, C.I. hand wheels, compression springs, balanced cranks, clamping levers, etc.

Quality at Moderate Prices!

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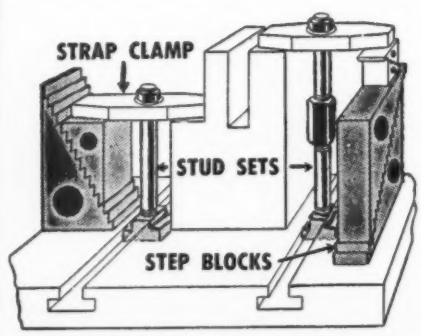
REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1922



SURE-GRIP STEP BLOCKS

Clamping tools of all types.

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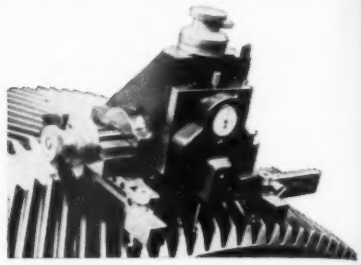
TIETZMANN TOOL CORP.
Box 277
North Main St., Englewood, Ohio

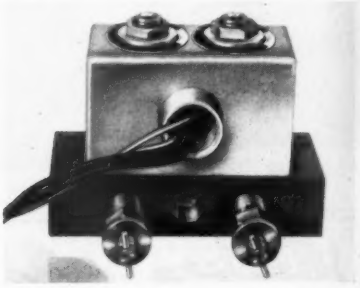
CIRCLE INFORM-A-GRAM KEY NO. 1923

An Ultra-Compact Solenoid Control Valve has been added to the BV Series (¼" port size) air or hydraulic control valves produced by Modernair Corp., 400 Preda St., San Leandro, Calif. It is available in both 3-way



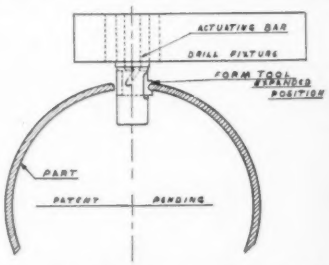
and 4-way types. The valve is designed for use in oil hydraulic or air circuits operating at 50 to 150 psi. **Circle Inform-A-Gram No. A45.**

Maintain Accuracy of Profile on large diameter gears within fine limits with a portable gear profile measuring instrument. The instrument will cover gears ranging from 18" to 16' or more in dia. It will also



test spur or helical gears. The instrument is mounted on the gear by three spherical locators and six sets of locators, ranging from 5/16" to ¾" in dia, are supplied. Morey Machinery Co., Inc., 383 Lafayette St., New York 3, or — **Circle Inform-A-Gram No. A46.**

Tools for Use in Radial Drill or Drill Press are produced to customer specifications by Falcon Tool Co., Box 4605, Mt. Elliott Sta., Detroit 34. Tools can be made to chamfer or deburr holes in any surface or pro-

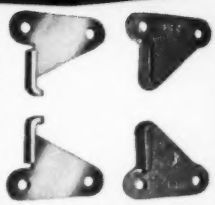


duce any form on the edge or inside surface of the hole. These and other operations can be done in any type of alloys that are machinable. The sketch shows the type of part construction. **Circle No. A47.**

PRESSED STEEL STAMPING
vs.
BRONZE CASTING

SMALL LOT TECHNIQUE USING TEMPORARY TOOLS

SAVES $142.40



Conversion from casting to stamping saved a Skokie, Illinois manufacturer of production line chains $142.40 on an initial order of replacement links that also proved lighter and stronger.

Dayton Rogers' short-run metal stamping facilities will handle blanks 22" square, material up to ⅜" thick, and drawing up to 4¼" deep.

SEND YOUR SKETCH, BLUEPRINT OR PART, PLUS QUANTITY, FOR PROMPT QUOTATION

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Manufacturing Company

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1931

WORLD'S HARDEST METAL

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TALIDE®
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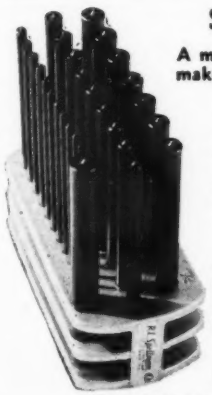
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 1934



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A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

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Single size available.

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CIRCLE INFORM-A-GRAM KEY NO. 1932

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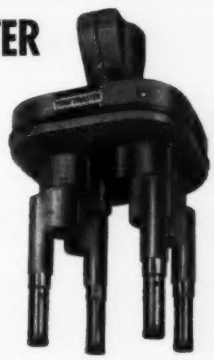
Double Eccentric Adjustable

DRILLHEADS



The only heads of this type standard with

Full Ball Bearing Construction

- greatest flexibility in drilling irregularly spaced holes
- sustained accuracy for trouble-free operation
- 20 Standard Models—3 to 8 Spindles
- Special Models on Order

Makers of
DORMAN AUTOMATIC
REVERSE TAPPERS

Write today for complete information on this *dependable* Double Eccentric Adjustable Drillhead . . . the latest addition to the Thriftmaster line of Single Eccentric Universal Joint Type Adjustable and Special Fixed Center Drillheads.

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Products Corporation
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THOMSON INDUSTRIES, INC.

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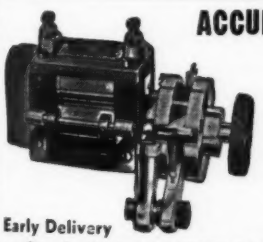
LANCASTER, PA.

CIRCLE INFORM-A-GRAM KEY NO. 1935



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Models to fit:
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FOR ANY JOB
FOR STOCK UP TO 12" WIDE

Early Delivery on Standard Models

"RFC" ROLL FEEDS are quality built for long dependable service.

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Pawtucket, Rhode Island
An Electrix Affiliate

CIRCLE INFORM-A-GRAM KEY NO. 1933

IT'S Economy ALL THE WAY!

— when you order your duplication requirements for these Standard Items . . .

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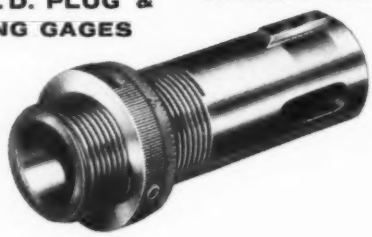

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Adjustable Adapter Sleeves and Nuts

"Economy" stocks always complete to assure immediate delivery. Worn-out plugs and ring gages salvaged at low cost.

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DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
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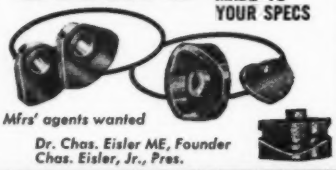
CAMS ALL TYPES MADE TO YOUR SPECS



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CIRCLE INFORM-A-GRAM KEY NO. 1944

Tool engineer of leading manufacturing plant

"Production is up 112% since we installed specially designed, ESSEX high speed steel rotary files."

"Formerly, we used standard type rotary files to cut magnesium. Since we switched to specially fluted, high speed steel files by ESSEX, production is up 112%!"

Find out how ESSEX high speed and carbide tools can help *you* save. Write for *free*, 12-page illustrated catalog today.

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Company.....
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CIRCLE INFORM-A-GRAM KEY NO. 1943

economically priced press room equipment

DURANT
Scrap Choppers

Four models to fit any power press. Employs simple electrical plug installation. Low initial cost. Enables you to get more for your scrap.

Manufacturers of Stock Reels, Roll Feeds, Straighteners, Scrap Choppers, Die Pullers, Foot Presses, Coil Cradles, Press Guards, Stock Oilers.

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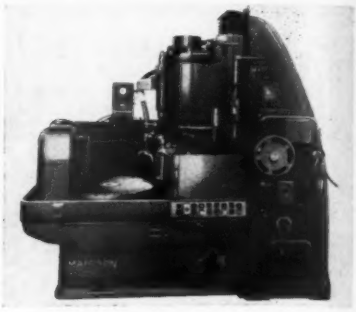
DURANT Tool Supply Co.
PROVIDENCE 3, RHODE ISLAND

CIRCLE INFORM-A-GRAM KEY NO. 1945

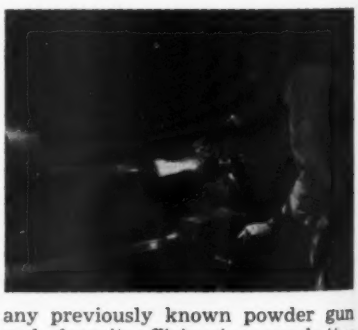
Redesigned Models 24 and 36 Vertical Rotary Surface Grinders feature increased stock removal rates and accommodate new types of work requiring closer tolerances. Automatic cycling is available by using one of



two automatic systems installed at extra cost. These grinders also have bases which are stronger and more rigid. Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill., or—**Circle Inform-A-Gram No. A48.**

Barrel Deburring of Small Parts is performed by an alkaline material. Oakite FM 183 combines a fine, fast cutting abrasive with surface active agents to keep media bright and clean. The use of the compound eliminates individual handling of parts, hand filing and abrasive-belt operations. Oakite FM 183 is used for deburring stamped or machined parts, grinding off sharp edges, improving surface finishes, etc. Oakite Products, Inc., 157 Rector St., New York 6, or — **Circle No. A49.**

Coatings of Stainless Steel, bronze and other metals, and hard-facing alloys and ceramics can be thermal sprayed without the use of compressed air with typeP ThermoSpray Gun. ThermoSpray Powders have been specially developed for use with the gun. The materials are applied many times faster than with



any previously known powder gun and deposit efficiencies are better than 95%. Metallizing Engineering Co., Inc., 1101 Prospect Ave., Westbury, Long Island, N. Y., or — **Circle Inform-A-Gram No. A50.**

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ROCK OF AGES

Unequalled Wear Resistance!

All Bryant Surface Plates are manufactured from fine-grained *true quartz* granite. Their resistance to wear surpasses *all* other materials used as surface plates.

Patented "head of the grain" finishing process gives added assurance of retained accuracy through years of use.

Full range of sizes available from the same selected black-and-white true granite, in precision, standard and layout accuracies.

Convenient stands feature both utility and appearance.

Write for quotation, stating size and accuracy desired

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Granite Surface Plates • Groove Gages • Internal & External Thread Gages
Magnetic Drum Memory Devices for Computing Systems
DIVISION OF BRYANT CHUCKING GRINDER COMPANY

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ULTRA-CHEX GAGE BLOCKS

for Every Need!

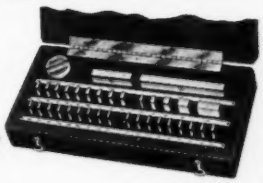
Supplied in one Superior Accuracy

5 MILLIONTHS ± ACCURACY

82 Block Set

$303.00 Complete

This Set will supply the needs of any discriminating shop that must work to gage-block precision.



34 Block Set $132.50

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COMPLETE LINE OF PRECISION INSTRUMENTS

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CIRCLE INFORM-A-GRAM KEY NO. 1952

ACCURACY .0002 T.I.R.

.0002 T.I.R. OR LESS AT SPINDLE NOSE, .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost. Same Accuracy Guaranteed!

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

K. O. LEE COMPANY

ABERDEEN, SOUTH DAKOTA

CIRCLE INFORM-A-GRAM KEY NO. 1953

STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

On Brown and Sharpe, and other automatics.

INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than $45 you get a dozen sets of ¾—16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime.

FREE: "Unified and American Screw Thread Digest"

THE EASTERN MACHINE SCREW CORPORATION 29-49 Barclay St., New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1961

DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
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THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
With DYKEM Steel Blue
Without DYKEM Steel Blue

CIRCLE INFORM-A-GRAM KEY NO. 1962

COLLINS

MICROFLAT®

BLACK GRANITE

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- ANGLE PLATES
- STRAIGHT EDGES
- LAYOUT PLATES
- PARALLELS
- T-SLOTTED PLATES

COLLINS MICROFLAT surface plates and precision accessories offer the user life-time accuracy at a minimum cost

All sizes—
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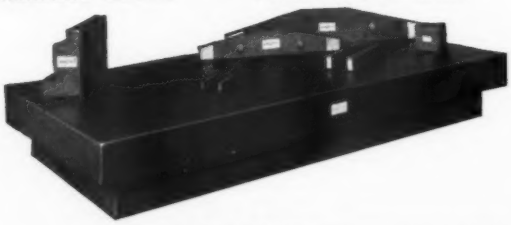

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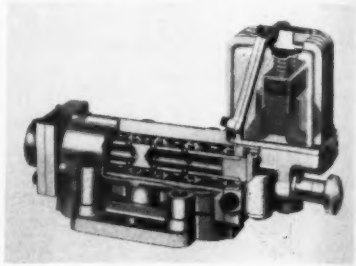
COLLINS MICROFLAT COMPANY, INC.

2326 E. 8th St. Los Angeles 21, Calif.

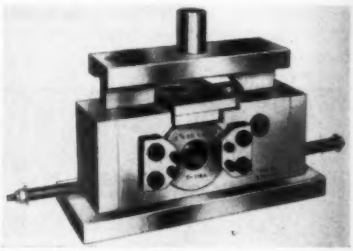
CIRCLE INFORM-A-GRAM KEY NO. 1963

High Cycle Operation is a feature of "B"-Type control valves introduced by C. B. Hunt & Son, Inc., Salem, O. They are rated at 600 cpm for continuous operation in air lines at pressures from 40 psi to 150 psi. They can be operated at high



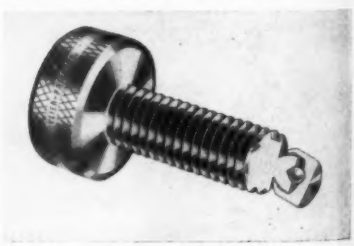
speeds for intermittent duty on air at 80 psi to 100 psi. Their valve chambers are formed by aluminum spacers held in accurate metal to metal end abutment. For details, get Bulletin 561 from the company, or—**Circle Inform-A-Gram No. A51.**

Cleaner Cutting, Accuracy of Alignment and greater speed in notching pipe and tubing are possible with the Arc-Twin. Cutting from the inside out, the tool leaves clean edges that need no further finishing. Perfect 180° alignment of



notching is automatic. The Arc-Twin can double-notch 600 pipe ends/hr. Vogel Tool and Die Corp., 1825-8 N. 32nd St., Melrose Park, Ill., or—**Circle Inform-A-Gram No. A52.**

Six Sizes have been added to the knurled head swivel-pad clamp line produced by Vlier Engineering, Inc., 8900 Santa Monica Blvd., Los Angeles 46. They are used for applications where finger-tight clamp-



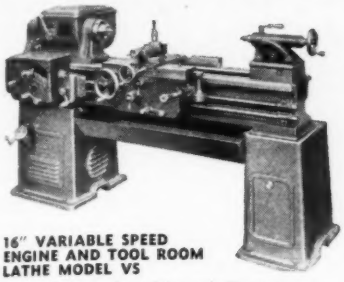
ing is sufficient. The tools feature a ball-joint construction which provides adjustment and rotation of the pad to accommodate off-angle part surfaces. **Circle No. A53.**

Over Fifty Years of Lathe Building Experience

2 NEW C&J LATHES AT YOUR SERVICE!

A fitting climax to over half a century of progressive improvement in every detail of designing, engineering and construction. Worth looking into . . . sure to result in

Fast, Accurate Turning at Lowest Costs



16" VARIABLE SPEED ENGINE AND TOOL ROOM LATHE MODEL VS

Standard taper key drive spindle nose. Heavy duty Precision Timken taper bearings on spindle. Infinitely variable spindle speeds from 30 to 1500 rpm.

WRITE FOR NEW BULLETIN A56VS

16" GEARED HEAD ENGINE LATHE MODEL GH

12 geared spindle speeds provide enormous pulling power. Choice of threaded or taper key drive spindle nose. Heavy duty Precision Timken taper bearings on spindle.

WRITE FOR NEW BULLETIN A56GH

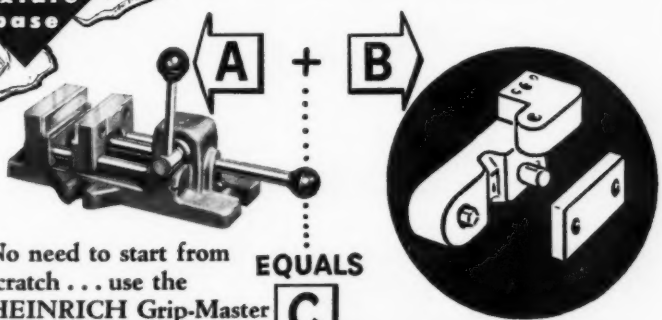
BOTH LATHES ALSO FEATURE:

- Separate rod for feed — lead screw for thread chasing only
- Heavy front and rear cabinet legs for maximum rigidity
- Extra length carriage — 23⅜ in.
- Wide range of threads and feeds — 48 separate threads 3 to 184 range
- Separate longitudinal and crossfeed lever controls employing positive type clutches
- Large crossfeed and compound rest dials

THE CARROLL - JAMIESON MACHINE TOOL CO. BATAVIA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1971

A Simple Formula for Solving Tooling Problems



A No need to start from scratch . . . use the HEINRICH Grip-Master Jig and Fixture base . . .

EQUALS **C**

B Simply add false jaws and bushing plate . . .

C Result . . . an accurate, low-cost Drill Jig.

Write for Complete Catalog

heinrich

TOOLS, Inc., Dept. 136-J, Racine, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 1972

They're now available from stock in new standard 18" lengths!

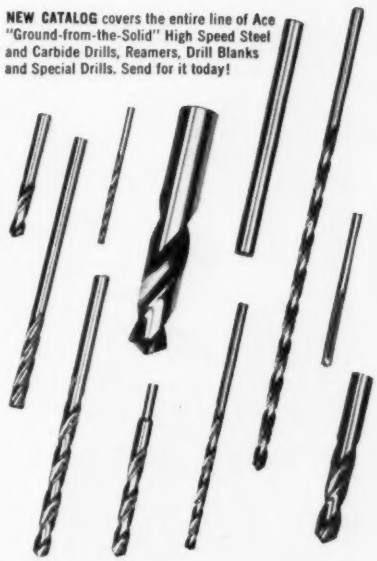
ACE

LONGBOY DRILLS

Been buying costly "specials" for deep hole drilling operations? Then you'll be glad to know that Ace Longboy Drills are now available from stock in a wide range of standard sizes and in both 12" and 18" lengths! What's more, their polished flutes are precision ground in top quality pre-hardened high speed steel to provide a finer finish, keener cutting edges, and longer drill life.

Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!



ACE DRILL

ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1973

Heavy Duty Bench Type
ALLEN
PUNCH PRESSES

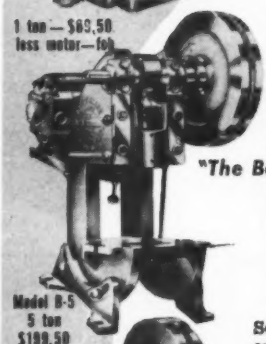
Powerful
Dependable and Economical
Fully Guaranteed

1 ton—$69.50 less motor—fob

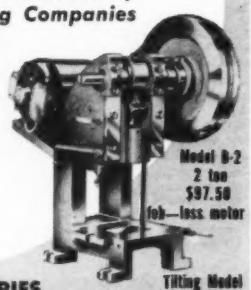
Designed for performance. Ruggedly built to give users long dependable service. The machine of a thousand uses. You will find Allen Punch presses adequate for many types of work now done on larger presses at greater expense.

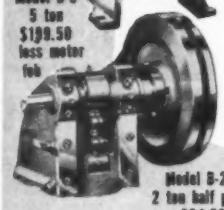
"The Best Machinery Dollar Value on the Market"
Thousands have been Purchased by
Leading Manufacturing Companies

Many Popular Models
1 to 5 ton capacities
Fully guaranteed



See Your Supply Dealer or write for FREE punch press catalog giving complete information, specifications and prices on our complete line of bench type punch presses.





ALVA ALLEN INDUSTRIES
Dept. TP Clinton, Mo.

Tilting Model
$127.50
less motor—fob

CIRCLE INFORM-A-GRAM KEY NO. 1981

Why SCHNORR Disc Springs?

BECAUSE

1. Unlimited life within borders of permissible loads.
2. No creeping, initial settling or gradual fatigue.
3. Axial center pressure.
4. Exact adjustment to the desired pressure.
5. Small constructional height, large deflection.
6. Large inherent damping.
7. Large impact damping especially with multiple stacking.
8. Excellent space disposition.
9. Spring pressure, Spring length and Spring deflection can be easily determined for the same Spring size or can be changed by lengthening or shortening of the Spring columns or by multiple stacking. In special cases the character line can be made to divert from its usual straight form by diversified stacking.
10. Most spring sizes available from stock.

KARL A. NEISE, Dept. TP
404 Fourth Avenue, New York 16, N. Y.

NEISE MODERNTOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1982

REPUBLIC

TWIST DRILLS—REAMERS

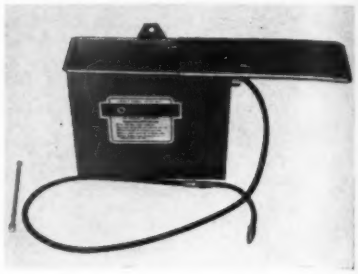
Whether it is for No. 40 holes in Titanium sheets for Jets or 1 3/16" holes in thick armor plate, Republic Drills give more holes per drill and more holes per hour of direct labor.

REPUBLIC DRILL & TOOL CO.
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.
MAKERS OF "CELFOR," "CENTURY," "REPUBLIC" AND "U.S. EAGLE" BRAND TOOLS

NEW YORK PLANT
100 LAFAYETTE ST., NEW YORK 13, N. Y. 3 PLANTS—NEW YORK—CHICAGO—LOS ANGELES

CIRCLE INFORM-A-GRAM KEY NO. 1983

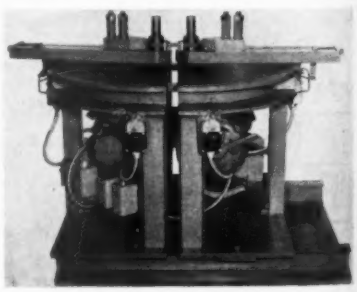
Cool Cutting Tools with Mist using the Tool-Mist Generators developed by Lloyd Tool Corp., 3757 Wilshire Blvd., Los Angeles 5. The generators permit faster machining speeds and increase tool life. They eliminate dry cutting methods on toolroom



mills, metal saw band machines, abrasive band machines, various types of grinding machines and many other machine tools. Further information is in Bulletin T-M from the company, or—**Circle No. A54.**

Two Monochromatic Lamp Floor Models use light waves with optical flats to measure the surface flatness of large parts at a glance. The lamps are inverted so that a part can be inspected on the optical flat rather than moving the flat onto the part. The new method avoids distorting thin parts due to the weight of the flat and eliminates handling heavy optical flats. Model 900-A is 52" high and Model 900-B, 37" high. Acme Scientific Co., 1451 W. Randolph St., Chicago 7, or —
Circle Inform-A-Gram No. A55.

This Bending Machine bends both ends of a pipe, tube strip or shape simultaneously. It is used primarily for bending two right angles in the same plane simultaneously, but can also bend closed curves. The Pedrimatic Bender is made up of two machines each with a motor and relay

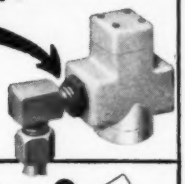


control mounted on a base which is adjustable as to centers and is controlled from a single starting button. Pedrick Tool and Machine Co., 3642 N. Lawrence St., Philadelphia 40, or—**Circle Inform-A-Gram No. A56.**

TRU-O-SEAL TEFLON SEAL

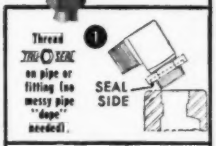
STOPS PIPE THREAD LEAKS instantly!

PAT. PENDING



Prevents future leaks!

TRU-O-SEAL does away with messy pipe "dope" compounds, eliminates damage caused by overtightening of conventional leaky joints, and is immune to ALL known hydraulic fluids and to steam, air, water, solvents, and practically all gases and chemicals. It withstands temperatures from —100° F. to plus 500° F., saves cost and labor of special or welded fittings, and has been fully field tested and proven by leading manufacturers. Comes in ⅛" to 2½" pipe thread sizes.


1
Thread TRU-O-SEAL on pipe or fitting (no messy pipe "dope" needed).
SEAL SIDE
2
Thread pipe or fitting 4 threads into port. Point in desired direction.
3
Tighten TRU-O-SEAL to complete leakproof assembly (only light torque required).

Write for data and prices

TRU-O-SEAL DIVISION
Flick Reedy Corporation

2046 N. Hawthorne • Melrose Park, Ill.

"Miller Fluid Power" is also a Div. of Flick-Reedy Corp.

CIRCLE INFORM-A-GRAM KEY NO. 1991

UNIVERSAL PARKSON GEAR TESTER
FOR SPUR - WORM AND HELICAL & BEVEL GEARS

ABOVE PHOTO SHOWS SET-UP FOR WORM GEARS TO CHECK CENTER DISTANCE, CONTACT OF TEETH, RUNOUT, ETC.
CYLINDRICAL BUSHING
ADJUSTABLE V-BLOCK
Scale and Vernier, Ease of adjustment, Convenient Features to hold Worm and Shaft on V-Blocks or Bushing.

PARKSONS ARE MADE IN SIZES
9" - 15" - 24/30" — PLAIN AND UNIVERSAL
ASK FOR DESCRIPTIVE ILLUSTRATED BULLETIN

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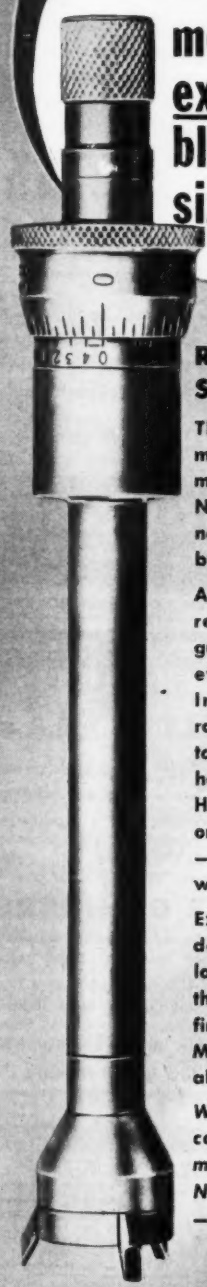
COMPLETE LINE OF PRECISION INSTRUMENTS
200-T LAFAYETTE ST. • NEW YORK 12, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1992

Etalon INGAGE measures the exact bore or blind hole size



Reading: .0001"
Sizes: 3/16" to 1.6"

This unique new precision measuring instrument will take measurements of blind holes. No masters or setting rings needed — measures *directly* — by .0001".

Automatically aligns in holes, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes. Extensions facilitate accurate measurements of holes up to 6 feet in depth. Hardened contact points exert only 11 oz. measuring pressure —will not damage even fragile work.

Exceptionally easy to read, deep clean-cut graduations laid out on a large diameter thimble. Dull chrome plated finish. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments: VERNIER CALIPERS—MICROMETERS —DIAL INDICATORS

ALINA

ALINA CORPORATION
401 Broadway, New York 13, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1993

12¢ or 4¢ to make this metal part?

This is a door handle tube, but it might be any of a hundred metal components or products. A big lock manufacturer was making it in his own plant at a cost of 12¢—until A. K. Tool, specialists in metal parts fabrication, undertook to turn it out for him for just 4¢.

Many of the nation's foremost manufacturers have found it cheaper, simpler to leave fabrication of their metal components to A. K. Tool Co.

Why not investigate—today—the production facilities and know-how that may effect substantial savings in your metal parts production?

Telephone: WEstfield 2-7300

Write or phone

A. K. TOOL CO., INC.
Highway No. 22 · Mountainside 5, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 2001

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE

DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

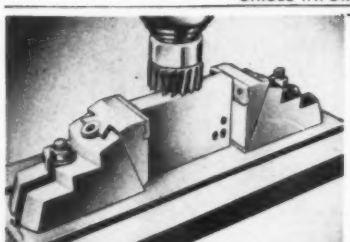
. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY
228 PARK AVENUE BELGIUM, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 2002



MASTER GRIPPING CLAWS
System Hubner

WHY use them?

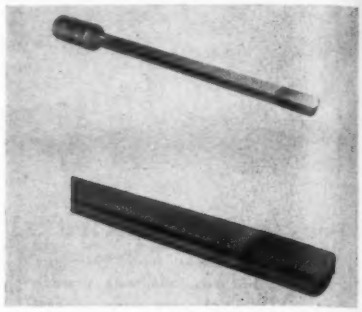
1. Clamping action Vertical as well as Horizontal—pressing workpiece down directly on the machine table. No hammering and still no air between.
2. Gain more working room.
3. Faster and more secure setups. Easier to handle.
4. Unlimited jaw opening.
5. No straps overlapping on the workpiece; more machining surface.
6. Extremely versatile—take light cuts or heavy cuts, use on small machines or heaviest production machines.

NEISE MODERN TOOLS

Exclusive Agents: KARL A. NEISE, 404 4th Ave., N. Y. 16, N. Y., Dept. TP

CIRCLE INFORM-A-GRAM KEY NO. 2003

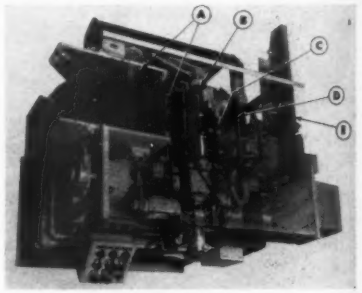
Decrease Downtime and Reduce Costs by using a new type deep hole drill. It is adaptable for either regular or special production operations, regardless of the depth of the hole. The drill range is from 0.125" to 3½" dia. The gun drill which is designed



to operate in a confined space, consists of a cutting tip, tubular fluted shank and a driver. Eldorado Tool & Mfg. Corp., 342 Boston Post Rd., Milford, Conn., or —
Circle Inform-A-Gram No. A57.

Lathe Centering Blanks, roll turning and milling cutter blades and solid cylinders are included in the new series of Firlomet cemented carbides. Catalog 2 with complete information on the cemented carbides is available by writing to Firth-Loach Metals, Inc., Buttermilk Hollow Rd., McKeesport, Pa., or —
Circle Inform-A-Gram No. A58.

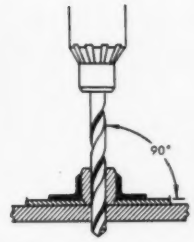
Straightness Is Held to 0.0015" TIR at the center by this automatic shaft straightening machine. It handles 600 pcs/hr in preparation for centerless grinding. Synchronization with



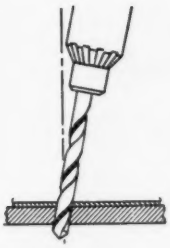
the grinders is not necessary because a 30-part storage chute automatically starts and stops the straightener as parts are needed. Cargill Detroit Corp., 2254 Cole Ave., Birmingham, Mich., or — **Circle No. A59.**

Speed Up Production, reduce worker fatigue and decrease tool replacement costs with a portable tool balancer. Model 10-C is adjustable to balance any tool weight from 5 to 10 lbs. It can be mounted on a beam or cable in work position above the operator for suspending portable power tools. Aero-Motive Mfg. Co., 1803 Alcott St., Kalamazoo, Mich., or—**Circle Inform-A-Gram No. A60.**

Free hand drilling of perpendicular holes using Anchor Bushing Drill Template at Ryan Aeronautical Co., San Diego.



ANCHOR BUSHING DRILL TEMPLATE — DRILL SUPPORTED AT LOW COST.



UNBUSHED DRILL TEMPLATE FOR LOW VOLUME PRODUCTION — NO DRILL SUPPORT.

AVOID WORK SPOILAGE—USE ANCHOR BUSHING DRILL TEMPLATES

NUTPLATE ANCHOR BUSHING

STANDARD ANCHOR BUSHING

Rejects threaten when unbushed drill templates are used to replace expensive drill jigs or fixtures on small quantity production runs.

Being low in cost and easy to make, Anchor Bushing drill templates prevent off-perpendicular drilling, inaccuracies of hole location and the use of wrong drill sizes.

Anchor Bushings are riveted or spot-welded to sheet metal, and riveted on or imbedded in laminated plastic materials. These lightweight drill templates can be made flat or in compound curves for a fraction of the cost, time and skill required for drill jigs or fixtures.

Learn how to make low cost, accurate drill tooling — write for the Anchor Bushing Catalog.

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2600 WEST 247TH STREET · TORRANCE · CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 2011

STANDARD FLUSH PIN GAGES

Precision Built
of Precision Ground
Oil Hardened
Tool Steel

Can be Furnished with Indicator Mountings
Completely Ground to Your Specifications and Ready for Use
No Design Necessary
Deliverable from Stock

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Representatives Wanted for Most Industrial Areas

UNION GAGE CORP.

711 Lehigh Avenue Tel. Murdock 6-9150 UNION, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 2012

Expanding Mandrels

Accuracy 001" - No Distortion

No Slipping - Everlasting

K. O. LEE CO.

ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 2013

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PRECISION SURFACES FOR LAYOUT, INSPECTION & ASSEMBLY

- ☐ Semi-Steel Layout Surface Plates
- ☐ Black Granite Layout Surface Plates
- ☐ Reading Tables
- ☐ Checking Tables
- ☐ Adjustable Floor Plates
- ☐ Bench Plates
- ☐ Lapping Plates
- ☐ Bench Blocks
- ☐ Straight Edges
- ☐ Surface Plates
- ☐ Surface Plate Stands
- ☐ Universal Right Angle Irons
- ☐ Angle Plates
- ☐ Universal Box Angles
- ☐ Box Parallels
- ☐ V-Blocks
- ☐ Cast-Iron Work Benches

THIS CATALOG .... shows the complete Challenge line of Precision Surfaces—all types, all sizes. See it before you buy any surface equipment.

SE-101

Challenge TRADE-MARK ®

TP-9

THE CHALLENGE MACHINERY COMPANY
GRAND HAVEN, MICHIGAN

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Company_____

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CIRCLE INFORM-A-GRAM KEY NO. 2014

Steelmobile
SIMPLIFIES and SPEEDS
✓ HANDLING
✓ TRANSPORTATION
✓ FEEDING of metal strip and bar stock to punch presses, shears, screw machines, etc.

ELIMINATES EXTRA HANDLING
JUST ROLL STOCK TO MACHINES
. . . and start feeding
No Unloading

Gives Your Shop "Assembly Line" Efficiency
Just load strip and bar stock on Steelmobile, roll to machines and feed. No transferring. One man can easily maneuver up to 2000 lbs. Saves labor, speeds production, cuts costs. Quickly pays for itself.

20-DAY FREE TRIAL OFFER

JARKE MANUFACTURING COMPANY
Write For Details
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Chicago 40, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2021

Compensates for Spindle Misalignment

KUTMORE ADJUSTABLE HOLLOW MILLS

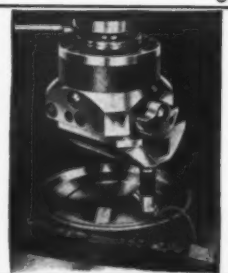
The Midget Floating Holder Hollow Mill, flange type, has micrometric adjustment, and is designed to permit easy compensation for any spindle misalignment.

WRITE TODAY For CATALOG 20-TD
It shows complete line of adjustable hollow mills. Our engineering department is at your disposal for special requirements.

1625 CLINTON AVE. NO.

CARL WIRTH & SON, INC.
ROCHESTER 5, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 2022



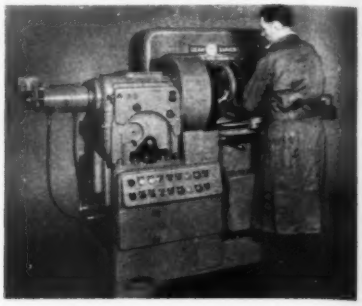
REASONS WHY MODERN ENGINEERS SELECT
The Wohlhaupter MASTERHEAD
For Precision Work & Most Economical & Automatic Operation
- The MASTERHEAD does Boring, Facing, Recessing, Undercutting, Outside Turning, etc.
- It does this in One Operation and on One Machine.
- Automatic Feeds. • Automatic End Release.
- Increases the capacity of your present equipment.
- Increases Production, makes Better Finished Work.
- Nine Models available for work up to 3¼" diameter. Also taper cutting heads.

Sole Agent *Send for illustrated literature*
KARL A. NEISE, 404 Fourth Ave., Dept. TP, New York 16, N. Y.

NEISE MODERNTOOLS

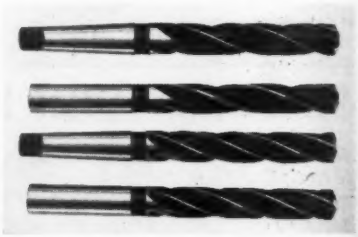
CIRCLE INFORM-A-GRAM KEY NO. 2023

A Semi-Automatic Loader on this improved Red Ring internal shaver speeds loading and unloading operations. Eliminated are hand loading and cutter meshing procedures in shaving internal spur and helical



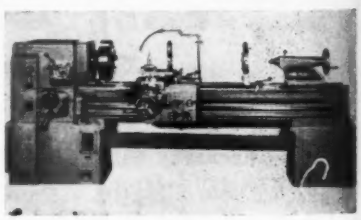
gears from 3 to 12-in pitch dia. The gear is hung on the shaving cutter, a cycle control button pressed and the gear is removed after shaving. National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, or — **Circle Inform-A-Gram No. A61.**

A Series of three and four flute "core" drills has been constructed so that the center portion of the drill does not cut. The "core" drills which are designed for enlarging holes, facilitate the use of greater



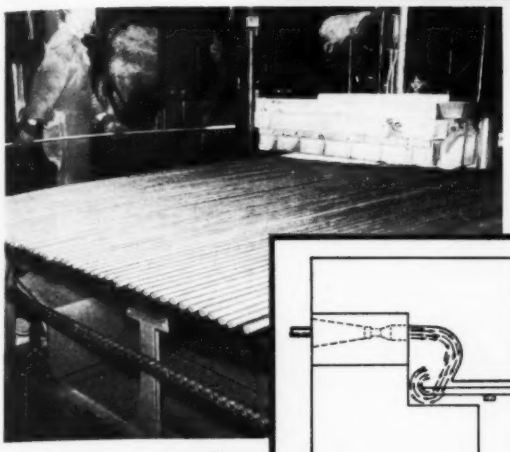
feeds, increasing production in enlarging operations. Sizes range from ¼" to 3" in taper shanks and from ¼" to 2" in straight shanks. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich., or — **Circle Inform-A-Gram No. A62.**

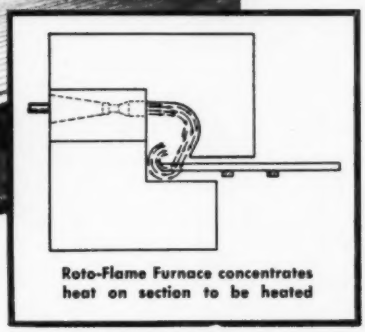
The Spindle Speed on this toolroom lathe is controlled by a direct reading "Pre-selector" allowing the next speed to be preselected while the machine is in operation. The



Imperial Type M-series precision geared toolroom lathes feature 18 spindle speeds, as high as 1,310 rpm. Aaron Machinery Co., Inc., 45 Crosby St., New York 12, or — **Circle Inform-A-Gram No. A63.**

Production Heating with G.A.S.





Roto-Flame Furnace concentrates heat on section to be heated

Visit our booth at METAL SHOW in Cleveland Oct. 8 to 12

Roto-Flame END HEATING Furnace

Produces Better Pole Line Hardware - - *FASTER*

The Battle Creek, Michigan plant of Oliver Electrical Mfg. Co., makers of electrical pole line hardware, have achieved these excellent results with their recently installed ROTO-FLAME furnace:

(1) **A production increase** of 33%, due to faster heating cycle and the steady flow of bars through the furnace.

(2) **A better product** — because the rapid and uniform heating achieved by this unit results in greater plasticity of the steel and virtually eliminates scale.

(3) **A 500% increase in die life** — again a result of the better flow of the metal and absence of scale.

This 46" long furnace in this installation heats up to 10" of the ends of ½" to 1" diameter bars, and the 4 strand chain conveyor handles from 20" to 10' long bars. Other Roto-Flame models are available to handle almost any diameter or length, production requirements up to several thousand pieces per hour, and can be furnished complete with automatic feed.

For further details ask for Bulletin 350A or send us your requirements

GAS APPLIANCE SERVICE, INC.
Industrial Gas Engineers
1936 W. BALMORAL AVENUE • CHICAGO 40, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 2031

NOW
FROM THIS CATALOG

NEW CARBIDE TOOLING PRECISION-MADE

Golden-Circle Rotary Tools

New! Elgin's expanded line of burs and rotary files, plus solid carbide end mills, all shapes and sizes precision-made. See how they can meet your requirements at lower cost! Write for your FREE copy of the new "Golden Circle" booklet today!

ABRASIVE DIVISION, DEPT. D
ELGIN NATIONAL WATCH COMPANY
Elgin, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2032

RUGGED
HEAVY-DUTY HAND CLAMPS

Knu-Vise offers rugged heavy-duty clamps, with solid bar or channel bar, and either hand or air operated, for all kinds of tough holding jobs.

In addition to their stand-up stamina for rough going, these Knu-Vise Clamps feature:

1—Easy and complete replaceability of parts
2—Hardened and ground bearing bolts
3—Minute adjustment of parts through self-locking nuts
4—Toggle Bars from C.R.S. Bars

Developments like these are typical of Lapeer engineering. More information? Write for catalog today on the models available.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**
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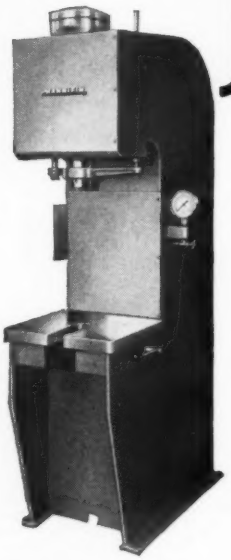
CIRCLE INFORM-A-GRAM KEY NO. 2033

PRICE LIST

ON HANNIFIN STOCK HYDRAULIC PRESSES



1-TON	$ 552
2-TON	$ 627
5-TON	$1,306
8-TON	$1,356
10-TON	$1,855
25-TON	$3,401

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

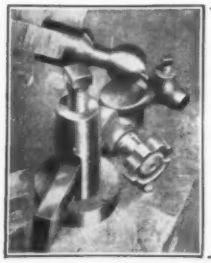
Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

HANNIFIN

HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 2041



Monarch Precision SHAPLANE Radius Tools

Illustration shows convex cutter for 1/4" to 2 1/2" balls.

FIVE MODELS for LATHES, SHAPERS, PLANERS, BORING MILLS

Range 1/2" to 3" for concave Radii. Also heavy duty models for radii to 6" on planers, etc.

PATENT PENDING

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C. B. TEETER, TOOL ROOM SPECIALTIES

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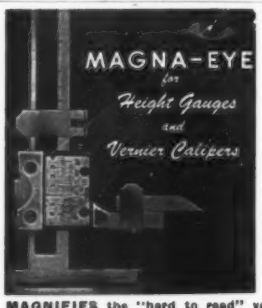


MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. **LENS** is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.

Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; S No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.

For Complete Information Write, Phone or Wire

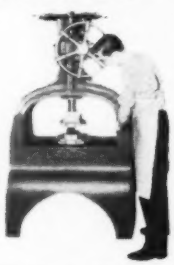
STEBAR COMPANY

215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 2043

MULTI-PURPOSE

PRODUCTO No. 2 UTILITY PRESS



You'll find continuous use for this press. Combines features of screw, ram and power presses in one powerful machine. Excellent for "shearing-in" or assembling punches and dies, separating punch and die holders . . . as a straightening press, arbor press, etc. Write for Bulletin TE4-101.

THE PRODUCTO MACHINE CO.

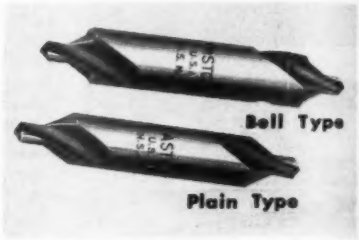
970 Housatonic Avenue

Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 2044

Diamond Wheel Grinding of carbide tools and other specialized grinding operations can be done more efficiently and economically with Compound No. 48. This coolant eliminates gum formation on the grinding wheel and table and precipitates grinding dust quickly and completely. It is recommended for offhand and plunge grinding and for operations involving high stock removal. International Chemical Co., Dept. 236, 2628 N. Mascher St., Philadelphia 33, or — **Circle No. A64.**

Combined Drills and Countersinks are now available from Fastcut Tool Co., 7405 E. Davison, Detroit 12. Precision spiral cut flutes permit greater accuracy at high cutting speeds and generate less heat in cutting, resulting in longer tool life. They are made in the plain and bell types. **Circle Inform-A-Gram No. A65.**



A New Line of Industrial Adhesives, protective coatings and sealers, for a wide range of industrial applications are now available from Raybestos-Manhattan, Inc., Special Products Dept., Bridgeport, Conn. Ray-Bond thermosetting adhesives can bond a large variety of materials, resistant to very low and very high temperatures. They can be applied by any commonly used industrial method. **Circle No. A66.**

Turn, Profile and Chamfer in either direction with this Kendex tool. Style KSDN which has the same general shape as Style "D" brazed tip tool, is available with either a 7° positive or a 5° negative back rake. It features square throw-away indexable inserts. Two styles of inserts can be had for both the positive and negative rake toolholders. Kennametal, Inc., Latrobe, Pa., or — **Circle Inform-A-Gram No. A67.**

Expensive Equipment
IS NOT NECESSARY
to Remove Broken Taps

The majority of broken taps, which cause such a waste of time and production—*can easily be removed* without resorting to expensive machines and equipment.

WALTON TAP EXTRACTORS
REMOVE BROKEN TAPS
QUICKLY • EASILY • INEXPENSIVELY

2, 3, 4, 5, 6 Flute Styles. In Sizes No. 4 to 1½".

This WALTON SPECIALIZED TOOL will back out most broken taps, without damage to threads or the work. Its value has been proven by its extensive and continued use throughout the metal working industry.

Write us, or simply attach this advertisement to your letterhead to receive technical, descriptive folder No. 38 giving complete specifications and prices.

Other Walton Specialized Tools: Tap Extensions; Pipe Stud and Screw Extractors; and "Multi-Position" Tool Holders. FREE TRIAL OFFER.

The WALTON Company
HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 2051

SHEARCUTTER PREMIUM
THREAD BROACHES
CUT TAPPING COSTS

IT'S NEW
Shearcutter Premium
THREAD-CUTTING BROACHES
deliver these advantages:

- End tapping trouble.
- Produce threaded holes by a Shearcutting action.
- Are practically unbreakable.
- Ground from hardened high-speed solid blanks.
- Require only half the power needed for tapping.
- Have an amazing long life.
- May be resharpened many times.
- Feed the chips out of the hole.
- Lower production costs.
- Replace standard taps in most sizes.

SHEARCUTTER TOOLS COST LESS IN THE LONG RUN

Three ultra-scientific cutting tools are used by practically every large manufacturing company in the U.S.A. Constant repeat orders prove their merit and value.

Patent Warning: All Shearcutter Tools are protected by U.S. and Foreign Patents, received, pending or applied for.

*ANOTHER AMAZING INVENTION OF RALPH GORDON FEAR

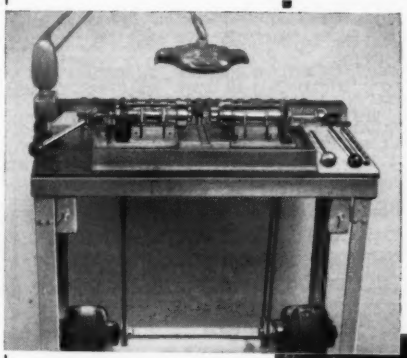
SHEARCUT TOOL CO.
MANUFACTURERS OF THE WORLD'S MOST SCIENTIFIC CUTTING TOOLS
7045 DARBY AVENUE RESEDA CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 2052

NOW POSSIBLE!

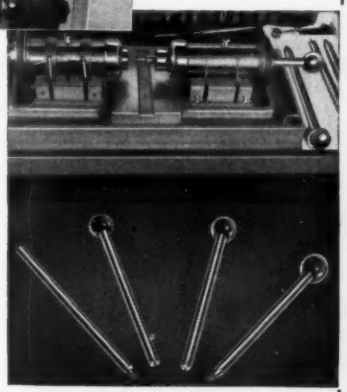
CONSECUTIVE OPERATIONS WITH MULTIPLE TOOLING -

Without removing workpiece from work spindle



JEDCO MICRO-DRILLING MACHINE

★



For Drilling Holes Parallel To A Cylindrical Axis

At last . . . a micro drilling machine with MULTIPLE TOOL QUILLS . . . allowing a series of operations — drilling, chamfering, reaming, etc. — to be done consecutively without need of removing workpiece from work spindle.

OR . . . with suitable attachments, another model can be used to drill holes on rectangular coordinates to an accuracy of plus or minus .0005.

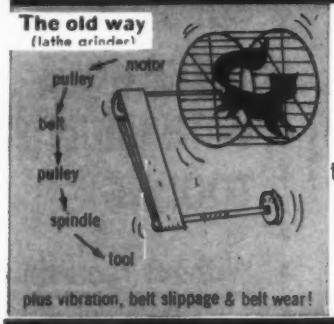
CONTACT US FOR YOUR PROBLEMS . . .

In small tools, minute drilling operations, Micro Drill Guides, automation engineering and building facilities.

MICRO DRILL GUIDE
DIVISION JEDCO
5980 SUPERIOR AVENUE CINCINNATI 36, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 2053

Take the direct approach to versatile tooling!



REPLACE OLD-FASHIONED LATHE GRINDERS WITH PRECISE POWER QUILLS!

Power Quill is a new name for a new tool that outperforms and outlasts lathe grinders, and saves fortunes through increased tooling versatility! Precise Super 60 Power Quills are unlimited in application, can be used on any machine and mounted in any position to mill, grind, finish, or micro-mill any material with abrasive wheels and tungsten carbide tools. And look at these exclusive Power Quill features:

OPERATE AT SPEEDS UP TO 45,000 RPM, DEVELOP FULL ½ H.P.
CAN FINISH TO 5 MICRO INCHES AND .0001" TOLERANCES ON PRODUCTION MILLING AND GRINDING WITH CARBIDE TOOLS.
MOTOR AND SPINDLE ARE IN ONE COMPACT, DIRECT-LINE, SOLID STEEL PACKAGE WITH GREATER SPEED (45,000 RPM) TORQUE, ACCURACY, AND RIGIDITY.
REMOVE METAL FASTER, BETTER SURFACE FINISHES, INCREASE TOOL LIFE.
MOUNT IN ANY POSITION ON ANY MACHINE, WITH PRECISE MOUNTS — FAST!

Attach this ad to your letterhead for **FREE** demonstration or literature!

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1341 CLARK STREET, RACINE, WISC.
Quality and precision since 1882
Grinder-Millers - Power Quills - High RPM Milling Machines - Mounts and Accessories - Rotary Tools

Precise

CIRCLE INFORM-A-GRAM KEY NO. 2061

B & L Magnifiers

CAN SAVE YOUR PLANT MONEY!

See that receiving inspection and purchasing are supplied with industrial magnifiers . . . use them in design engineering and your sample shop . . . also for assembling and production inspection. Prompt detection of defective materials and workmanship can save a company untold sums in a year.

FREE! *Write today for tell-all booklet and catalog,* "INDUSTRIAL MAGNIFIERS, HOW TO CHOOSE AND USE THEM."... *Bausch & Lomb Optical Co., 50409 Bausch Street, Rochester 2, New York.*

BAUSCH & LOMB
SINCE B&L 1853

CIRCLE INFORM-A-GRAM KEY NO. 2062

Accurate Marking of round tags at high speeds is accomplished by a rotary table which can be attached to most models of Automark electric tag marking typewriters. The table can also be used with the Automark

hand lever actuated typewriter. The attachment makes the entire line of Automark typewriters adaptable to any type tag marking use. Defiance Machine & Tool Co., 1920 S. Vandeventer, St. Louis 10, Mo., or —
Circle Inform-A-Gram No. A68.

Models UE-3 and 3D-5 Panto-Engravers have been improved by providing higher cutter spindle speeds up to 18,000 rpm and a 2½ times more powerful motor. With increased spindle speed, the cutter

makes a cleaner, more defined cut in metals. Production is speeded up when using tungsten carbide cutters on phenolic plastics, stainless steel and other abrasive materials. H. P. Preis Engraving Machine Co., 284 Industrial Branch, U. S. Highway 22, Hillside, N. J., or —
Circle Inform-A-Gram No. A69.

A New Series of End Mills for Aluminum and its alloys has been announced by Goddard and Goddard Co., Detroit 23. The heavy shanks provide more reach and rigidity on plunge cutting and profil-

ing operations. These end mills have higher spiral flutes than conventional cutters for rapid disposal while plunge cutting. The series is available in 23 sizes and styles.
Circle Inform-A-Gram No. A70.

If you have a problem of PRECISION INTERNAL GAGING

your answer may be SELF-CONTAINED

COMTORPLUG

Positive accuracy to fractions of .0001"

For holes 1/8" to 10" dia.

USERS INCLUDE:

Airesearch Mfg. Co.
Allison Div.
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FEATURES INCLUDE:

Positive gaging accuracy to fraction of .0001" regardless of who operates it.

Portable, self-contained — no wires, hoses, or electronic gear.

Indicates actual size, a fixed — not passing — reading.

Positive 2-point gaging — automatic centering.

Shallow holes, deep holes, inside splines, open-end holes gaged easily.

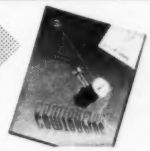
Detects ovality, back or front taper, bell mouth, barrel shape.

Reaches to bottom of blind holes. Gages work while still held in chuck.

A shop tool for all-day every day use.

SEND FOR BULLETIN 49

It may hold your answer



COMTOR COMPANY

82 FARWELL ST., WALTHAM 54, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 2371

Drill Hardened Steels without Annealing—

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—
With "HARDSTEEL"

BLACK DRILL COMPANY, INC.

1368 East 222nd St. • Cleveland 17, Ohio

"HARDSTEEL"

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SERVICE GARMENTS

Shopcoats – Coveralls

Matched Shirts and Pants

Shop Caps

LADIES' UNIFORMS

Lettering and Emblems

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Commercial & Industrial Uniform Co.

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OPERATE HORIZONTAL MILLING MACHINES?

FREE DETAILS illustrate how you can increase horizontal milling machine feeds and speeds up to 200%. Jergens tapered roller bearing bushing replaces present bronze bushing at low cost without machine change. Eliminates bushing wear, cutter breakage, arbor wear, scoring and chatter. Permits use of carbide cutters to full capacity on new or old machines. Write for cost cutting facts today!

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PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

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US

IMMEDIATE DELIVERY on all wheel sizes, STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

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LEAD HAMMERS—Buy Cook "SHUR-GRIP"

They're a MUST in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

COMPLETE LEAD HAMMER SERVICE

Write for circular and prices

LAWRENCE H. COOK, INC.

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IN 11 SIZES No. 6 to 1" N C In all S. A. E. sizes

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

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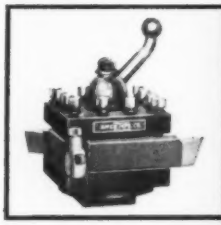
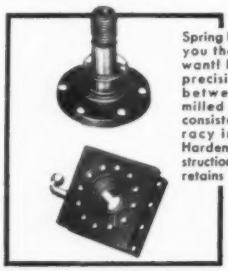
Enco Turrets Assure ±.0005" Accuracy



by being on the ball!

Enco's passion for exacting accuracy is paying off in metal working operations everywhere! Combining precision lathe output with efficiency and economy has become a necessity . . . and Enco turrets have proved the ideal answer. An Enco turret transforms one lathe into a production machine, each operation of unsurpassed accuracy due to *spring loaded ball design!*



Spring loaded balls give you the accuracy you want! Hardened steel precision balls locked between accurately milled spherical seats consistently give accuracy in re-indexing. Hardened all steel construction minimizes wear, retains built in precision.

Write today for catalog No. 53. There's an ENCO turret for every lathe.

ENCO

Manufacturing Company, 4520 W. Fullerton Ave.
Chicago 39, Ill., Dept.

CIRCLE INFORM-A-GRAM KEY NO. 2081

Check Angles faster with . . .

REGLUS

Swiss Inclinometer

Model No. 1

- *Dial diameter 2½"
- *Adjustable zero setting thru 360°
- *Accurate and adaptable to machine and manual operations
- *Values of less than 30' can easily be read
- *Clamp or magnetic base

MODEL No. 1 :$20.50 Clamping capacity 1¾"

Model No. 2 :$27.50 Magnetic base

Write for descriptive folder

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19313 Farmington Road
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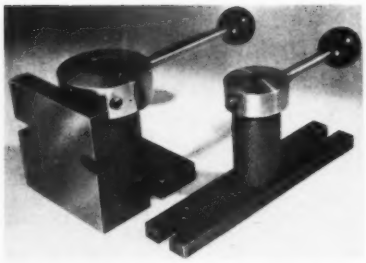


A Precision Production Holding Device

For drilling, tapping, milling, threading, reaming, etc., holding finished parts. Helpful on sub-assembly. Universally adaptable to drill presses, milling machines, surface grinders, tapping machines, etc. In 6 models, using 3C, 1A, 5C and 3AT Collets—capacity to 1", depending on Model. Price $29.50 to $62.50. Write for further information and name of Tool Supplier. Territories open for Suppliers.

ARROW MACHINISTS
Trade Mark
17 NORTH WEST STREET MOUNT VERNON, NEW YORK

CIRCLE INFORM A-GRAM KEY NO. 2083

Induction Heater Lowers Costs. Increases Output

Utilization of electronic type induction heaters for brazing has resulted in lower costs, increased production, and greater overall efficiency for the Lake Tool Division of Besly-Welles Corporation, at Crystal Lake, Illinois.

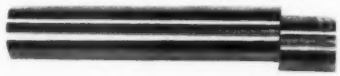
A General Electric 5 KW has made it possible to easily keep pace with scheduled monthly production of 35,000 carbide cutting tools. Direct

savings thus far, from use of the heater, have amounted to 20% in brazing costs and 20% in diamond wheel costs.

Prior to installation of the heater, all tool brazing had been performed with a hydrogen atmosphere furnace. Now the main part of their production is handled by a 5 KW heater.

The heater was installed slightly more than three years ago and, during that period, has been operated 16 hrs day for much of that time.

New Model Jump Edge Finder made by Glover Mfg. Co. will locate holes to a 0.0003" tolerance in one min. Both halves are 0.500" in dia with all surfaces hardened and



ground. The firm's deluxe edge finder is still available with the 0.200" dia end that is necessary for small pieces and where the location of holes is from slots or cavities under ½" wide. Glover Mfg. Co., 422 Park Ave., Meadville, Pa.

Circle Inform-A-Gram No. A71.

You Get Things Done With Boardmaster Visual Control

- ☆ Gives Graphic Picture of Your Operations—Spotlighted by Color
- ☆ Facts at a glance — Saves Time, Saves Money, Prevents Errors
- ☆ Simple to operate — Type or Write on Cards, Snap in Grooves
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- ☆ Made of Metal. Compact and Attractive. Over 100,000 in Use

Complete price $49.50 including cards

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Write for Your Copy Today

GRAPHIC SYSTEMS
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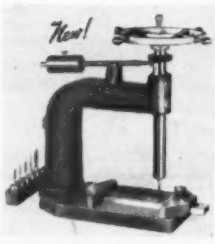
CIRCLE INFORM-A-GRAM KEY NO. 2084



LASSY

SUPERSENSITIVE HAND TAPPER

New exclusive features and top quality make Lassy Tappers outstandingly the finest available. Write for illustrated circular showing 3 models, and also Universal Tap and Die Guide.

LASSY TOOL CO. Plainville, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 2085

. . . Belt Grinding, from Page 80

The feed belt carries the magnet cases across the face of the revolving abrasive belt to the right-hand end of the feed rails, where parts drop into an ejection chute.

A 36-grit, wet or dry, aluminum-oxide, 8″ by 107″ belt is used for this operation, at a speed of 4100 sfpm. Abrasive belt life is approximately 2,500 cases and belt changing time is one min. The belt is backed by a 9″ by 12″ chrome alloy air-hardened steel platen which can be adjusted vertically to present a fresh, flat contact surface to the work for even wear distribution.

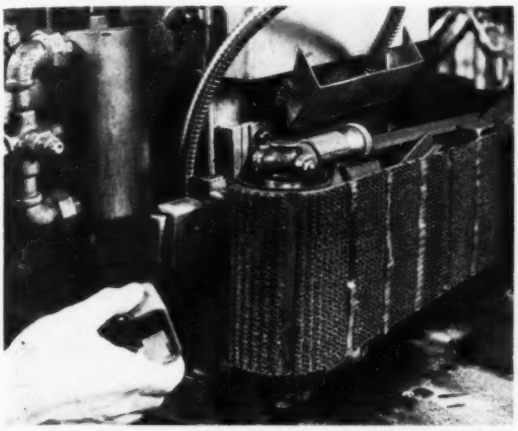


Fig. 3. Cases are spaced one to each tufted panel of feed belt. The right ends of the feed rails are slightly lower to give parts a natural cross-feed tendency.

Coolant is a 40 to 1 mixture of water and soluble oil. The BG-8's self-contained coolant system jet-sprays the solution against the entire width of the revolving belt as it passes below the worktable. The coolant is also sprayed over the actual work area to eliminate heat from friction and to supplement belt flushing. Flushed waste is caught in a drawer-type sediment container above the coolant tank.

The magnet cases are belt-ground at the rate of 700 per hr on the Engelberg platen grinder equipped with the revolving belt-feed fixture. The pieces are then projection welded to the top plates of 6″ to 12″ loudspeaker assemblies for radio and television sets.

end

Cut costs on hole cutting with . . .

BOREMASTER

Finished holes 1½″ to 11¾″ diameter to a depth of 8″ on your present equipment

with

THE BOREMASTER

Not just another Trepanning Cutter but a real heavy duty tool. Stock removed in one piece eliminating waste. TIME SAVINGS + MATERIAL SAVINGS = COST SAVINGS

For full details write

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404 4th Ave., New York 16, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2091

YESTERDAY'S PIONEER . . . TODAY'S LEADER

Patent Applied for

WELDON

COUNTERSINKS and DEBURRING TOOLS

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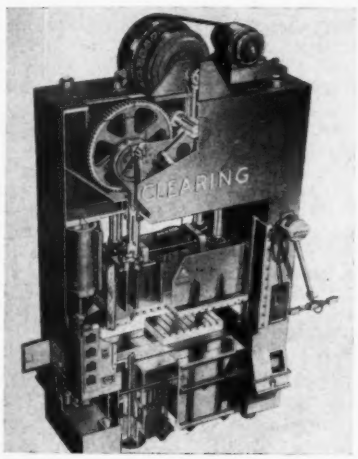

it. At no point in the Clear-Flo circuit is the oil passage reduced to less than the area of a 5/32" tube. As a result, this system provides metering without restricting. In addition, large, clear passages are provided at the emission points. There is no danger area where clogging can take place. Any foreign material in the system is flushed completely through the system and removed by the filter. The metering devices are calculated to place the right amount of oil at each individual gear and bearing in the press. No adjustment is ever necessary in the field.

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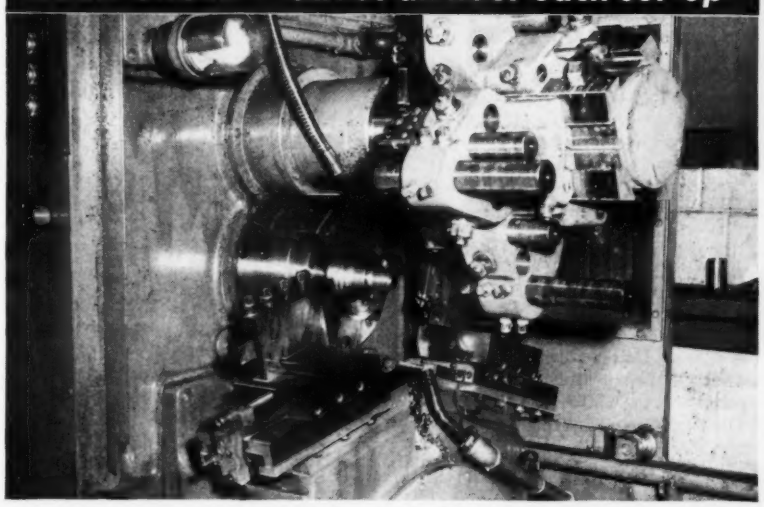

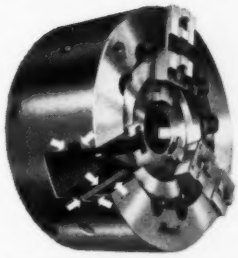

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Business Management Aids

Management Training Programs for Fall 1956 are listed and described in a brochure published by the National Institute of Management, Inc., 1008 National City Bank Bldg., Cleveland 14. Among the ten courses offered are production control and inventory management, work measurement, operations research, methods improvement and standard data. Contact the Institute for copies of the brochure, or — **Circle No. F1.**

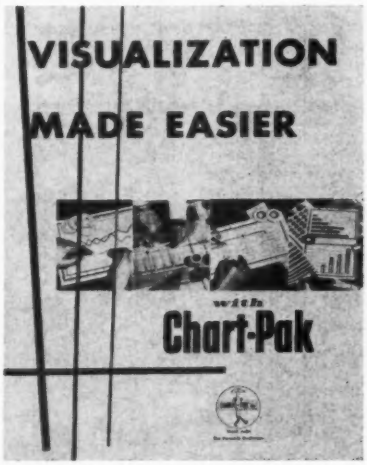
The Scientific Utilization of the Energy in Color to promote efficiency in industry is explained in a 23-page booklet. Today, the booklet notes, painting is being done with colors that will increase productive efficiency and create a cheerful environment that improves morale, reduces absenteeism and lessens the danger of accidents. Obtain a copy of the booklet for information on the system of color dynamics developed by Pittsburgh Plate Glass Co., Paint Advertising Dept., 632 Ft. Duquesne Blvd., Pittsburgh 22, or — **Circle Inform-A-Gram No. F2.**

A Case History Brochure on the use of a Rectigraph photocopying machine by General Mills Inc. has been released by The Haloid Co., Dept. GM-1, Rochester 3, N. Y. The brochure illustrates and describes how paperwork is speeded, errors eliminated and costs cut on reports of all kinds, organization charts, engineering drawings, etc. through the use of the machine. **Circle Inform-A-Gram No. F3.**

"What Has Happened to Order No. 2261?" details individual order scheduling with Sched-U-Graph. The Sched-U-Graph is used for various kinds of project and order scheduling, machine load control, sales control, etc. The folder illustrates and explains two simple methods of individual order control. Copies of the folder are provided by Remington Rand, Div'n of Sperry Rand Corp., 315 - 4th Ave., New York 10, or — **Circle Inform-A-Gram No. F4.**

The Metropolitan Oakland Area Factfile points out the advantages of the section for industrial plant sites. Included in the Factfile are plant location and Oakland maps, several data sheets on the area's advantages and brochures. Copies of the Factfile are made available by Alameda County New Industries Committee, 1320 Webster St., Oakland, Calif., or **Circle Inform-A-Gram No. F5.**

"Visualization Made Easier" is a 20-page catalog describing the Chart-Pak method of making organization and flow charts, graphs and office and plant layouts. The method consists of "drawing" charts, graphs and



layouts with pressure sensitive tapes and templates. The tapes and templates can be mounted on plastic planning boards with printed grid lines. Chart-Pak, Inc., 100A Lincoln Ave., Stamford, Conn., will supply the catalog with details, or — **Circle Inform-A-Gram No. F6.**

Type Personalized Letters, invoices, orders and other documents automatically at the rate of 100 words/min with the Flexowriter Duplex automatic writing machine. The operation is controlled entirely by punched paper tape. The machine is cable-connected to a motorized tape reader. Two punched paper tapes are required, one containing the date and body of the document, and the other, the name and address of the person to whom the document is addressed. Commercial Controls Corp., 1 Leighton Ave., Rochester 2, N. Y., or — **Circle No. F7.**

A New Microfilming Development has been introduced by Burroughs Corp., Detroit 32. Model 205 Micro-Twin will perform both microfilming and microviewing. The machine is available also with various optional features that make it adaptable to a wide range of microfilming applications. Details on the standard model and its additional features are found in a folder issued by the company, or—**Circle Inform-A-Gram No. F8.**

Model 4000 Engineering Drafting Desk is one of the units in the Modulator line of engineering and drafting equipment produced by Emeco Corp., Hanover, Pa. The line is built around 14 basic models which can be put together and interchanged for efficient, economical and accurate work planning. A bulletin lists the advantages of the equipment, notes the outstanding features, shows space-saving layouts and pictures the units available. Get your copy from the company, or — **Circle Inform-A-Gram No. F9.**

"A Preface to Profits" gives the facts on American credit insurance. Discussed are capital management, capital turnover, collection period, demand payment, financing customers, delinquent accounts, credit losses and the effect of credit insurance. Included are letters from users of the insurance and a list of the advantages of credit insurance. Also available is a "Credit Insurance Primer" which answers basic questions about credit insurance. Request copies of both booklets from American Credit Indemnity Co., First National Bldg., Baltimore 2, Md., or — **Circle Inform-A-Gram No. F10.**

Two Microfilm Processing Operations Are Combined in One by a new optical viewer and mounting unit. It is used for making large-screen visual checks of the filmed material during the actual card mounting steps. With the semi-automatic Optical Mounter, it is possible to mount 400 to 450 microfilm frames/hr to pre-punched or pre-typed index cards. This unit can be used with silver, diazo or heat developing films and will mount 35 mm positive or negative film (with modifications, 16 mm). Dexter Folder Co., Filmsort Div'n, Pearl River, N. Y., or — **Circle Inform-A-Gram No. F11.**

Copies in a Minute are possible with Verifax copying. The speedy, simple, economical method produces accurate copies in ordinary room light. A bulletin explains the operation of the process and pictures and discusses some of its many applications. Also detailed are the advantages of Verifax copying. Pictured and described are the copiers available. For more information, get a bulletin from Eastman Kodak Co., Business Photo Methods Div'n, Rochester 4, N. Y., or — **Circle Inform-A-Gram No. F12.**

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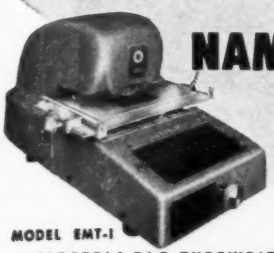

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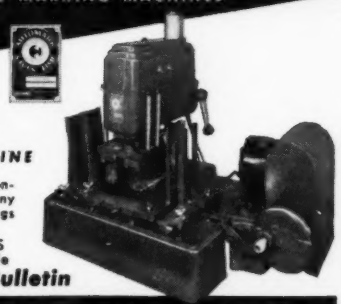

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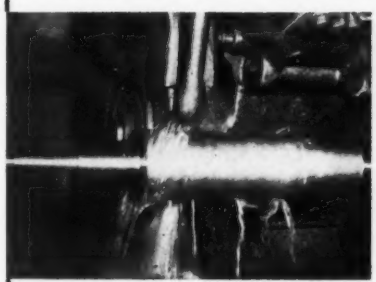

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HELICAL SHAPED GANG CUTTERS MILL WING SPARS

Recently, North American Aircraft, El Segundo, California, designed a gang cutter made to the Helicarb design. These cutters are being used on a special high cycle machine to mill the wing sub-assembly on the F-100 Super Sabre. The cutters are of section design (each section having a number of helical carbide inserts), ganged and stepped to cut the critical contour in the wing spar at the area where the wing attaches to the fuselage.

Fig. 1. Overall view of a special high-cycle milling machine built by North American Aviation to mill steps on the shoulder section of the Super Sabre wing. Wing is in final stage of completion.

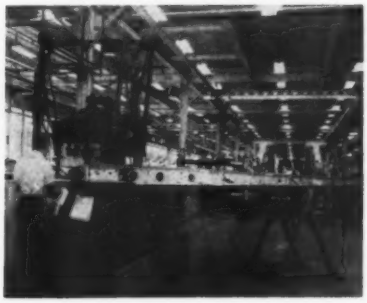


Fig. 2. The finished part requires four passes through the machine, since both top and bottom of the two protrusions on the wing is stepped. Finish is not critical but is good, in spite of fast table travel and lack of rigid work support.

The construction of the cutters is as follows: The cutter bodies are made separately and the seats for the inserts are machined. The inserts are then twisted to a 25° helix angle and brazed in place to the cutter body with a 10° positive rake angle. The cutters are then assembled and ground to their specific related diameters as an assembly, and dynamically balanced at 1800 rpm.

A cut 6" wide by ⅛" deep is possible with these cutters, using dampeners on the spar to reduce vibration to a minimum. The feed rate of the machine at present is 48"/min. Even with the lack of rigid holddown fixturing on the outboard end of the wing, the unique shearing cutting action of the Helicarb design produces finishes of 20 rms and better, reducing handwork to a minimum. Good finish is vital, of course, in spar milling.

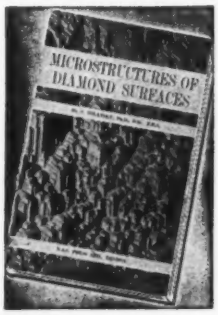
Fig. 3. Gang cutter, designed by North American tool designers and built to the Helicarb design, used to mill steps on the shoulder section of the Super Sabre wing.

MICROSTRUCTURES OF DIAMOND SURFACES

by S. TOLANSKY, Ph.D., D.Sc., F.R.S.

The remarkable pictures obtained by Professor Tolansky in his research laboratory and reproduced in this book (many of them never before published) enable fundamental new deductions to be made regarding the nature of diamond surfaces and therefore of the growth of diamond.

The text is written for the general reader and includes an elementary introduction to the optical techniques developed by Professor Tolansky that make such photographs possible. These techniques enable height or depth features as small as one twenty-five millionth of an inch to be resolved and effective magnifications in depth of half a million times to be made by simple and inexpensive means. One hundred and forty-three of these extraordinary pictures are reproduced as special plates in this book. $8.50* per copy.



CONTENTS:

The Optical Techniques
Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
The Nature of the Trigons
Some Growth Features on Octahedron Faces
Linear Discontinuities on Diamonds (Slip?)
The Etching of Diamond
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CIRCLE INFORM-A-GRAM KEY NO. 2141

People Are Important

by Erwin K. Taylor, Ph. D.
President
PERSONNEL RESEARCH AND
DEVELOPMENT CORP.
Cleveland 20, Ohio

TRAINING ON TRIAL

IN THE AUGUST ISSUE of TOOLING AND PRODUCTION, we discussed the need for some hard headed evaluation of training — especially human relations training programs. To illustrate our point we mentioned some of the results obtained in the training evaluation research performed by the Personnel Research Board of Ohio State University for the International Harvester Company. In that column we could mention only a few of the results that were obtained.

I believe that this study is destined to become a classic in the field rivaling the famous, overrated "Hawthorne" studies in its impact on human relations training in industry. Because of the broad implications of the study for all management people, I'm going to devote this month's remarks to the telling of a little more about what was done and what was found.

The Ohio State Industrial Psychologists carefully studied more than 1800 statements which have been collected concerning leadership. As a result of their analysis they discovered that almost all the statements fitted into either of two groups. They were:

"Consideration" — Friendship, mutual trust, respect and warmth between the leader and his group, also the **absence** of arbitrariness and impersonal relationships with his subordinates. These qualities are what is meant by "consideration". Typical comments indicating high consideration are:

"He is friendly and can be easily approached."

"He puts suggestions that are made by foremen under him into operation."

Part of the purpose of the training program was to improve the considerateness of the foremen to the workers under them.

. . . Continued on Page 217

Store Your Bar, Rod and Pipe Stock Faster, Easier Neater, Safer

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MINI-MODULE
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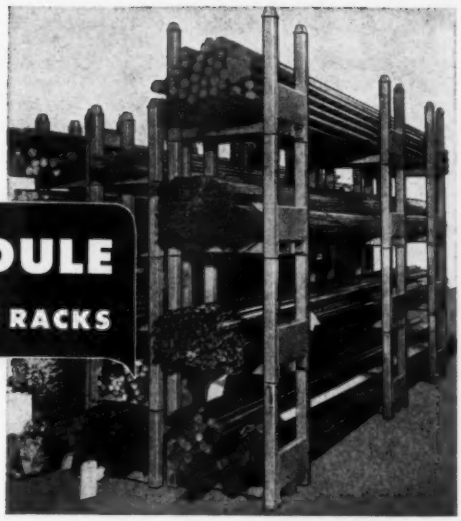

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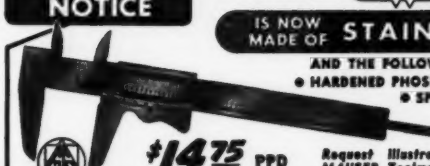

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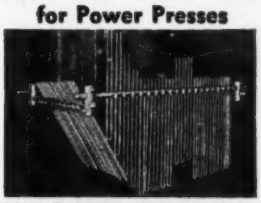

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"Initiating Structure" — Inclination on the part of the foremen to "call the shots". A foreman who is high on initiating structure tells each member of the group what he is supposed to do and organizes the group carefully. Not only does he decide what is to be done but also how the work should be accomplished by the people under him. Supervisors who were high on "initiating structure" were described like this:

"He insists that his men follow standard ways of doing things in every detail."

"He decides in detail what shall be done and how it shall be done."

Questionnaires were developed to find out the opinions of three groups about leadership with special emphasis of course on "consideration" and "initiating structure". Workers were asked how their foremen acted and how they thought the ideal foreman should act. The foremen were asked to describe their own techniques of leadership and also to describe their own opinion of the ideal foreman as well as what they thought their boss expected of them. And finally high level management personnel were asked how their foremen led their men and also what they expected of the foremen. In this way each of three important groups — the workers who were supervised, the foremen themselves, and the bosses who were in charge of the foremen's work — were asked how the foremen actually did their day's work and, second, how they should do it.

It is impossible to give all the results of this large and extensive study, but I will try to pass on to you some of the highlights:

1. As I reported in the August issue of TOOLING AND PRODUCTION, foremen who had been trained in Human Relations had **lower** scores on "consideration" and higher scores on "initiating structure" than the foremen who had not been trained. This result was the exact **opposite** of what was expected and desired from the training course. The trainers had hoped to be able to prove the foreman's consideration for the people who worked for him and to have him spend less time in carefully outlining exactly what each man was to do. It did not work out that way.

2. By comparing the foremen's questionnaires with the questionnaires filled out by the bosses, it was apparent that each foreman's way of supervising the workers under him depended much more on the way his boss felt about leadership than what they learned in the Human Relations Training Program. If the boss tended to be considerate of his employees and gave each man more of a free rein in planning his own day-to-day activities, the foreman treated the people under him in much the same way. If, however, his daily work was laid out for him by an inconsiderate boss, he soon learned to treat the people under him in much the same way.

3. As you might suspect, people on the three different levels looked on the foreman's job that differently. The foremen's bosses were interested in having the foremen structure their workers' jobs by telling them exactly what to do, while paying little attention to their feelings. The workers, on the other hand, felt that the ideal boss would be more considerate of them and would let them work out the details of their jobs. No wonder the foreman was in the "middle." His boss wanted him to lay out the work in detail, the worker wanted to do that himself. The worker wanted to work for a man who treated him well but the bosses really didn't care much about that.

4. There was an important difference between production departments and non-production departments in the way higher management rated supervisors. In the production departments, initiating structure was considered to be very important, while in the non-production departments, consideration was more important. Less considerate supervisors and those more inclined to "structure" for better ratings.

These statements are based, of course, on one study conducted in one company. It was a good study but we should be careful about applying the results to every other organization. What we need are more managements with the foresight to sponsor similar studies in other organizations.

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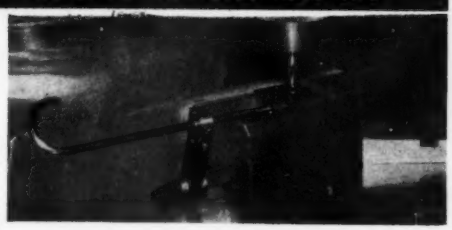

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A. A. Gage Co. 158
Abrasive Engineers 213
Abrasive Machine Tool Co. 10
Ace Drill Bushing Co., Inc. 57
Ace Drill Corp. 197
Acme Tool Co. 156
Advance Tables 156
Aget Mfg. Co. 181
Air-Mite Devices, Inc. 180
A. K. Tool Co., Inc 200
Alina Corp. 199
Allegheny Ludlum Steel Corp. 99
Allen, Alva F. 198
Allied Products Corp.
Richard Brothers Punch Div. 49
American Drill Bushings Co. 5
American Positive Grip Vise Corp. 149
American Standard Perforators 162
Armstrong-Blum Mfg. Co. 168
Armstrong Bros. Tool Co. 144
Arrow Machinists 208
Arrow Tool & Reamer Co. 214
Avildsen Tools & Machines, Inc. 198

Balas Collet Mfg. Co. 219
Barnes Co., Inc., W. O. 118
Bausch & Lomb Optical Co. 206
Bearings, Inc. 136
Bellows Co., The 41
Benchmaster Mfg. Co. 26
Besly-Welles Corp. 36
Black Drill Co., Inc. 207
Blake Co., Inc., Edward 170
Blanchard Machine Co., The 52
Bliss Co., E. W. 122, 181
Bokum Tool Co. 172
Borel & Dunner Co. 208
Boyar-Schultz Corp. 126
Brookfield, Inc. 141
Bryant Chucking Grinder Co. 134, 195
Buck Tool Co. 211
Buckeye Tools Corp. 32
Bullard Co., The 31
Burg Tool Mfg. Co. 191
Bushman Co., H. L. 187

Cadillac Gage Co. 66
Carroll-Jamieson Machine Tool
Co., The 197
Cerro de Pasco Corp. 176
Challenge Machinery Co., The 201
Chandler Tool Co. 188
Chaso-Royco Tool Co., Inc. 215
Chicago-Latrobe 18
Chicago Screw Co. 50
Ciba Co., Inc. 159
Cincinnati Milling Machine Co., The 3
Cincinnati Shaper Co. 100
Clearing Machine Corp.
Div. of U. S. Industries, Inc. 14
Cogsdill Tool Products 161
Collins Microflat Co., Inc. 196
Comet Tool Co. 162
Commercial & Industrial
Uniform Co. 207
Comtor Co. 207
Cone Automatic Machine Co. 37
Connors & Davis Sales Corp. 177
Cook, Inc., Lawrence H. 207
Crucible Steel Co. of America 44
Cullen Mfg. Co. 189

Dayton Rogers Mfg. Co. 62, 193
Dearborn Gage Co. 28
Defiance Machine & Tool Co. 213
Detroit Die Set Corp. 27
Detroit Power Screwdriver 30
Detroit Stamping Co. 148, 179
DeVlieg Microbore Co. 58
Dickerman Mfg. Co., H. E. 157
Dilley Mfg. Co. 189
Donley Products, Inc.,
Jergens Div. 207
Dow Chemical Co., The 61
Durable Punch & Die Co. 147
Durant Tool Supply Co. 194
Dykem Co., The 196

Eastern Machine Screw Corp., The 196
Economy Tool & Machine Co. 194
Eisler Engineering Co., Inc. 194
Elgin National Watch Co. 203
Elox Corp. of Michigan 24
Enco Mfg. Co. 208
Erickson Tool Co. 70
Essex Rotary File & Tool Corp. 194
Ex-Cell-O Corp.
Continental Tool Works Div. 142

Federal Tool & Mfg. Co. 189
Fellows Gear Shaper Co., The 51
Flick-Reedy Corp.,
Miller Fluid Power Div. 38
Flick-Reedy Corp.,
Tru-Seal Div. 199

Ford Mfg. Co., Inc., M. A. 190
Gaertner Scientific Corp., The 185
Gage Co. 183
Gallmeyer & Livingston Co. 6
Gardner-Denver Co.,
Keller Tool Div. 22
Gas Appliance Service, Inc. 203
General American Transportation Corp.,
Parker Kalon Div. 111
Genesee Mfg. Co. 186
Glover Mfg. Co. 217
Gorton Machine Co., George 117
Graphic Systems 208
Greenlee Brothers & Co. 132
Greist Mfg. Co., The 152
Grotnes Machine Works 115

Hamilton Tool Co., The 131, 133, 135
Hamilton Watch Co. 121
Hannifin Corp. 204
Hardinge Brothers, Inc. 42
Harig Mfg. Corp. 69
Hartford Special Machinery Co., The 106
Heimann Mfg. Co. 207
Heinrich Tools, Inc. 197
Hi-Shear Rivet Tool Co., The 201
Hovis Screwlock Co. 138
Huebner Publications, Inc. 120, 148, 210, 214
Humm Safety Equipment Co. 215
Hutchinson Co., William T. 67

Ideal Industries, Inc. 189
Industrial Tectonics, Inc. 188

Jaco Devices, Inc. 154, 189, 191
Jacobs Mfg. Co. 29
Jarke Mfg. Co. 202, 215
Jarvis Corp. 39
Jergens Tool Specialty Co. 182
Jergens Division
Donley Products, Inc. 207
Johansson Gage Co., C. E. 21
Johnson & Bassett, Inc. 185
Johnson Mfg. Corp. 128
Jones & Lamson Machine Co. 43, 129

Kearney & Trecker Corp.,
Special Machinery Div. 55
Keller Tool Div.,
Gardner-Denver Co. 22
Kennametal, Inc. 109
Kidde Precision Tool Corp. 148, 190

Lapeer Mfg. Co. 203
Lassy Tool Co. 191, 208
Lavallee & Ide, Inc. 4
Lee Co., K. O. 195, 201
Lepel High Frequency Labs., Inc. 13
Littell Machine Co., F. J. 178
Lodding, Inc. 166
Logan Engineering Co. 160

Magna Driver Corp., ... 182
May-Fran Engineering, Inc. 23
McCrosky Tool Corp. 12
Mead Specialties Co. 15
Melin Tool Co., Inc. 145
Metal Carbides Corp. 193
Metallurgical Products, Dept. of G.E. 60
Metlfax 216
Mettler Machine Tool, Inc. 108
Meyers Co., Inc., W. F. 176
Micro Drill Guide 205
Miller Fluid Power Div.,
Flick-Reedy Corp., ... 38
Minnesota Mining & Mfg. Co. 105
Modern Industrial Engrg. Co. 155
Moline Tool Co. 165
Moore Special Tool Co., Inc. 124, 187
Morrison Engrg. Co. 156
Motch & Merryweather
Machinery Co., Inc., The 53

National Acme Co., The 7
Nebel Machine Tool Corp.,
Smith & Mills Shaper Div. 187
Neise, Karl A. 198, 200, 202, 209
Nelco Tool Co., Inc. 64
New Britain Machine Co., The
Hoern & Dilts Div. 45
Nicholson File Co. 114
Norgren Co., C. A. 116
Northwestern 184
Numberall Stamp & Tool Co. 183

Ohio Knife Co., The 33
Oliver Instrument Co. 54
O'Neil-Irwin Mfg. Co. 68

Parker Stamp Works, Inc. 25
Parker-Kalon Div. General
American Transportation Corp. 111
Penn Engrg. & Mfg. Corp. 20
Perfex Gage & Tool Co. 191
Petz-Emery, Inc. 186
Pivot Punch & Die Corp. 153
Pope Machinery Corp. 171
Portage Double-Quick Tool Co. 143
Porter Precision Products 139
Potter & Johnston Co. 97
Pratt & Whitney Co., Inc. 16, 47
Precise Products Corp. 206
Preis Engraving Machine, H. P. 187
Producto Machine Co. 113, 204
Putnam Tool Co. 1

Reid Tool Supply Co. 192
Rice Pump & Machine Co. 200
Richard Brothers Punch Div.
Allied Products Corp. 49
Richards Co., J. A. 187
Ring Punch & Die Co. 167
Roll Feeds Corp. 193
Rotor Tool Co. 119
Royal Oak Tool & Machine Co. 2

S & E Machine Products, Inc. 140
Sales Service Machine Tool 146
Scherr Co., Inc., George 195, 199, 215
Schmidt, Inc., Geo. T. 184
Scully-Jones & Co. 130
Segal, Edward 181
Service Machine Co. 192
Sesco, Inc. 169
Set Screw & Mfg. Co. 56
Shearcut Tool Co. 205
Sheffield Corp., The 19
Sheldon Machine Co., Inc. 163
Shore Instrument & Mfg. Co., Inc. 148
Simonds Abrasive Co. 35
Skinner Chuck Co. 154
Small Lot Stamping Co. 177
Smith & Mills Shaper Div.,
Nebel Machine Tool Corp. 187
South Bend Lathe Works 177
Spellman Co., R. L. 193
Sperry Products, Inc. 156
Spiral Step Tool Co. 178
Spitfire Tool Co. 213
Spring Specialty Co. 215
Standard Electrical Tool Co. 150
Standard Parts Co. 98
Standard Pressed Steel Co. 8
Stebar Co. 204
Sturdy Broaching Service 180
Superior Steel Products Corp. 103
Syntron Co. 154

Taft-Peirce Mfg. Co., The 164
Tannewitz Works, The 179
Teeter, C. B. 204
Thriftmaster Products Corp. 193
Tietzmann Tool Corp. 179, 192
Tomco Products Co. 190
Torrington Co., The 173
Tru-Seal Div.,
Flick-Reedy Corp. 199

Union Gage Corp. 201
U. S. Burke Machine Tool Div., The 104
United States Diamond Wheel Co. 207
U. S. Electric Mfg. Corp. 190
U. S. Industries, Inc.,
Clearing Machine Corp., Div. 14
Universal Engineering Co. 63

Valvair Corp. 125
Vapor Blast Mfg. Co. 59
Verson Allsteel Press Co. 220
Vlier Engineering, Inc. 48
Vulcan Tool Co. 162

Wales-Strippit Corp. 102
Walls Sales Corp. 191
Walton Co., The 205
Ward Machinery Co. 181
Wardwell Mfg. Co., The 185
Watts Brothers Tool Works 194
Webber Gage Co. 137
Weldon Tool Co. 209
Wells Mfg. Corp. 213
West Point Mfg. Co. 40
Whistler & Sons, Inc., S. B. 183
Willey's Carbide Tool Co. 151
Wirth & Son, Inc., Carl 202

Yoder Co., The 34
Yost Mfg. Co. 179

Zagar Tool, Inc. 110

.. 25
..111
.. 20
..191
..186
..153
..171
..143
..139
.. 97
16, 47
..206
..187
3, 204
... 1

..192
..200

... 49
..187
..167
..193
..119
... 2

..140
..146
99, 215
..184
..130
..181
..192
..169
... 56
..205
... 19
..163
..148
... 35
..154
..177

..187
..177
..198
..156
..178
..213
..215
..150
... 98
... 8
..204
..180
..103
..154

..164
..179
..204
..193
79, 192
..190
..173

..199

..201
..104
..207
..190

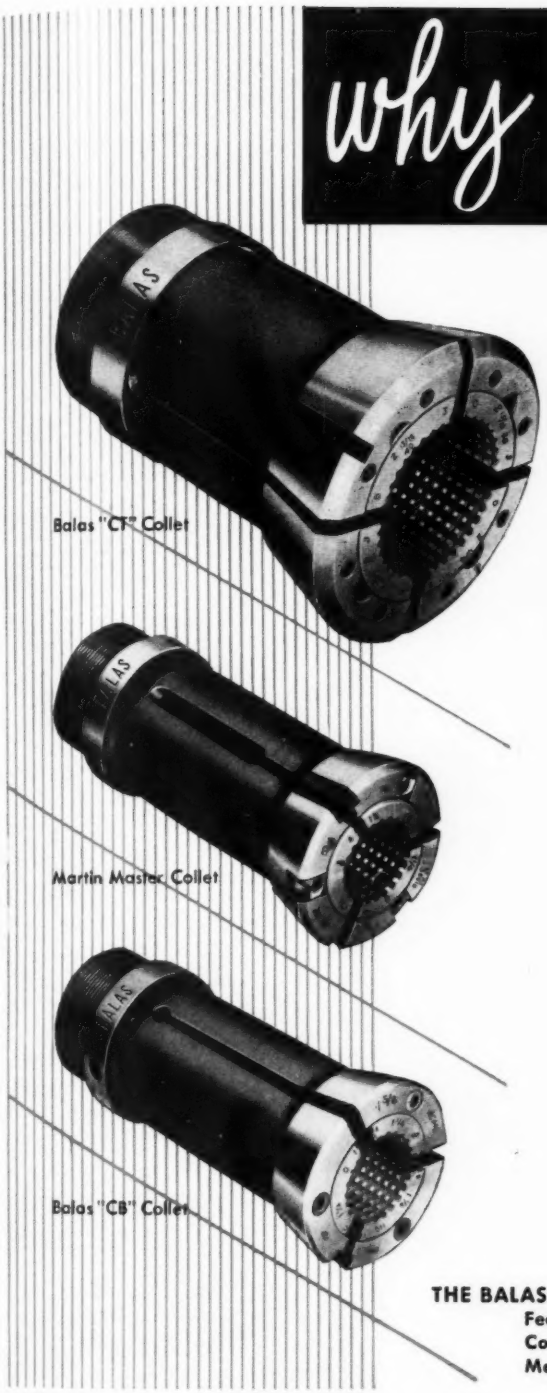
... 14
... 63

..125
... 59
..220
... 48
..162

..102
..191
..205
..181
..185
..194
..137
..209
..213
... 40
..183
..151
..202

... 34
..179

..110



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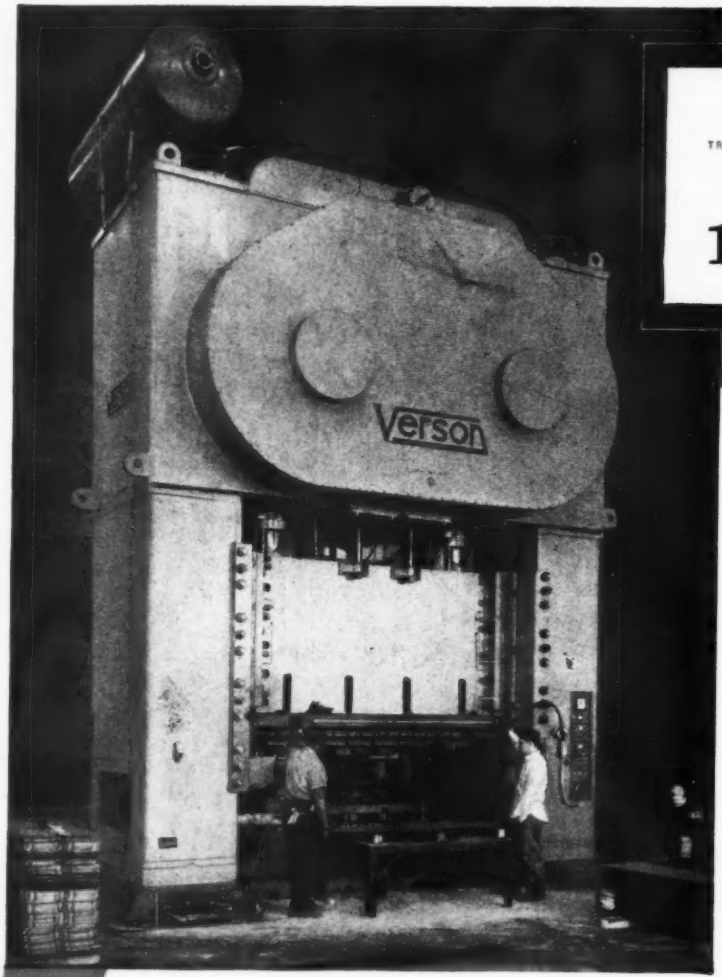

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